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A DICTIONARY OF UNIVERSAL KNOWLEDGE.

By

WRITERS OF EMINENCE IN

LITERATURE, SCIENCE, AND ART

VOLUME XIV.

LONDON.

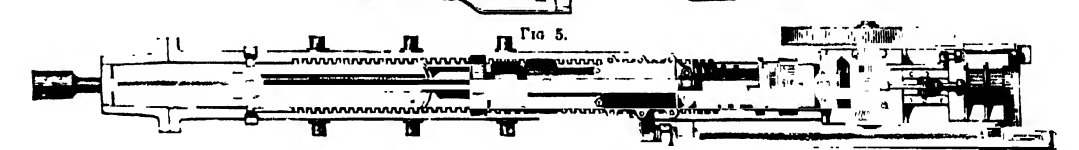
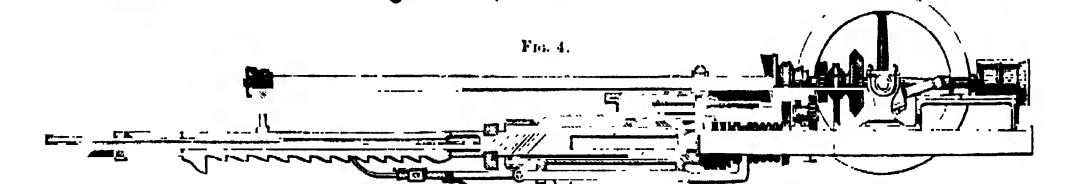
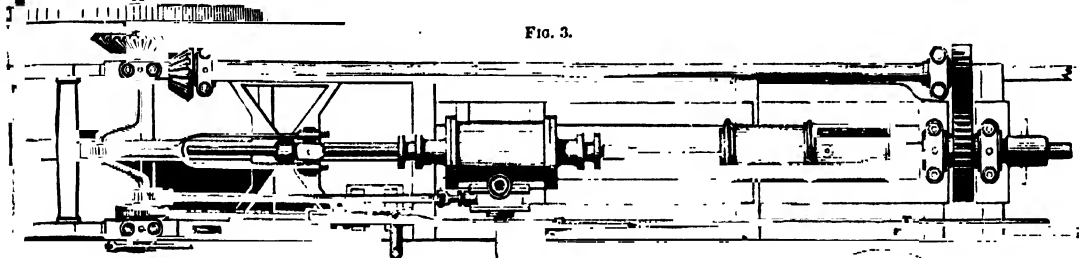
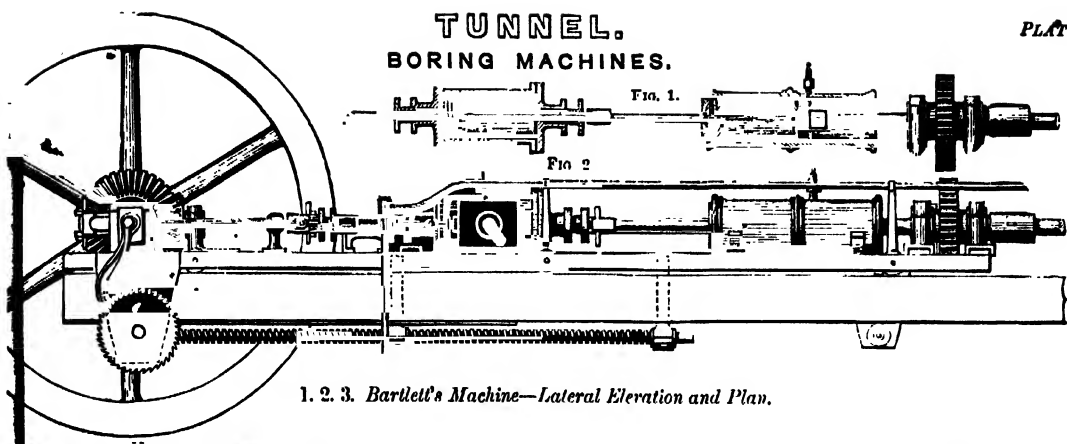
WILLIAM MACKENZIE, 69 LUDGATE HILL, E C

EDINBURGH, AND GLASGOW

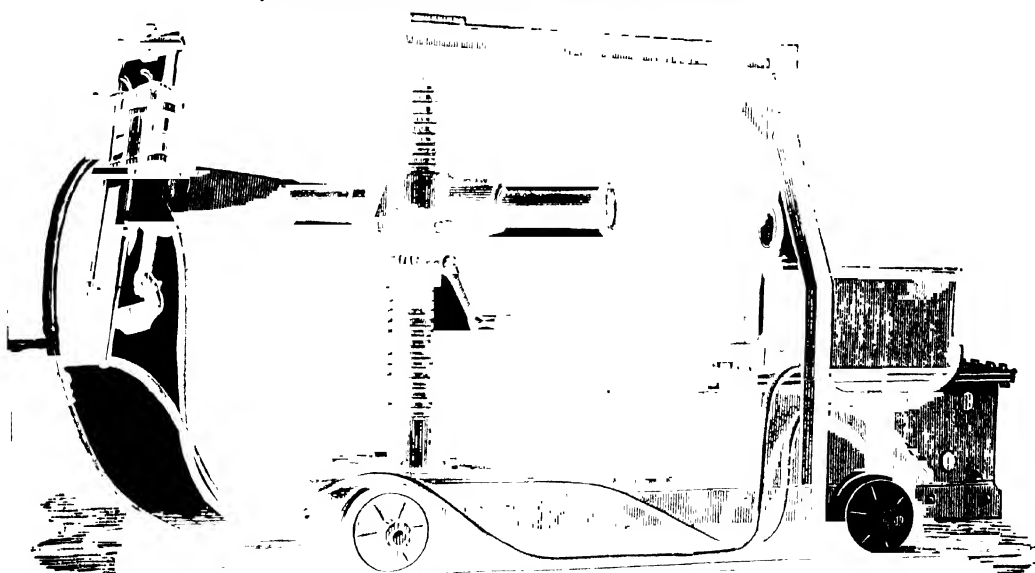


# TUNNEL. BORING MACHINES.

PLATE 1.



4, 5. Sommeiller & Co's Machine—Lateral Elevation and Plan.



6. Doering & Sach's Tunnelling Machine.





*Tunnel under the Mersey at Liverpool*





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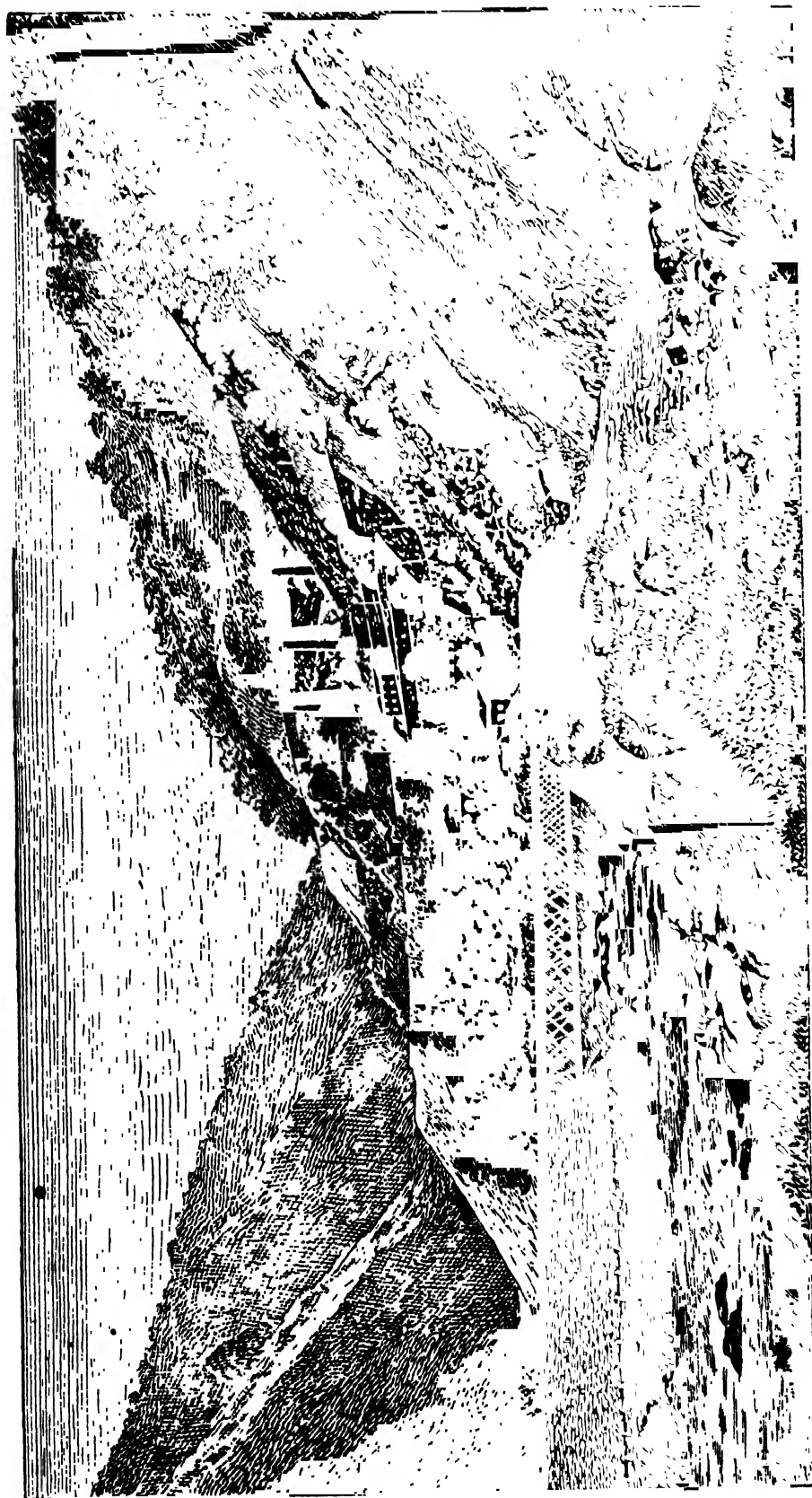
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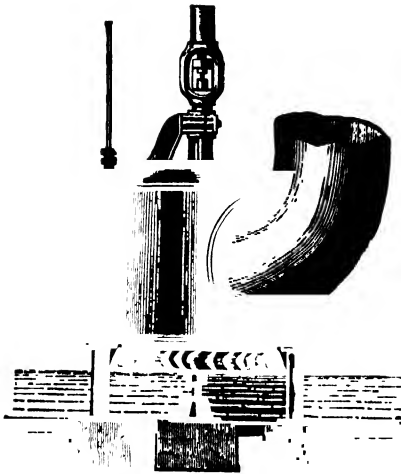
T U N N E L .



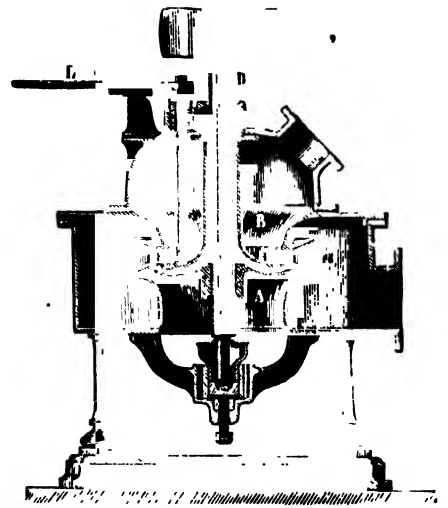
*St. Gotthard Tunnel—The Three Levels near Biasca.*



# TURBINE.



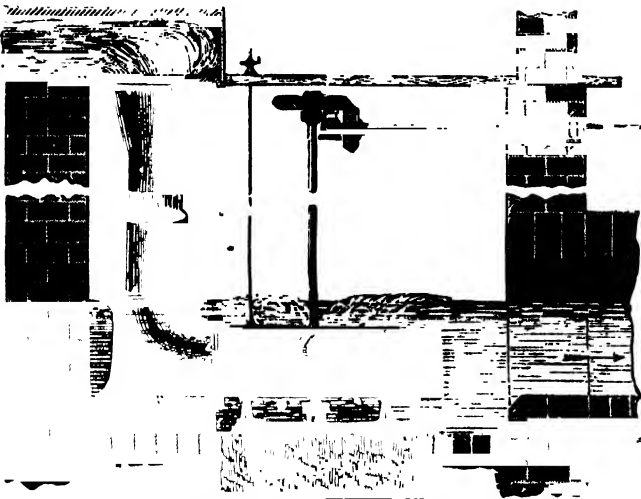
1. Donkin's Turbine—Elevation.



3, 4. Fontaine & Brault's Turbine—Vertical and Horizontal Sections.



2. Donkin's Turbine—Vertical Section.



6. Schiele's Turbine—Vertical Section.



5. Schiele's Turbine—Horizontal Section.

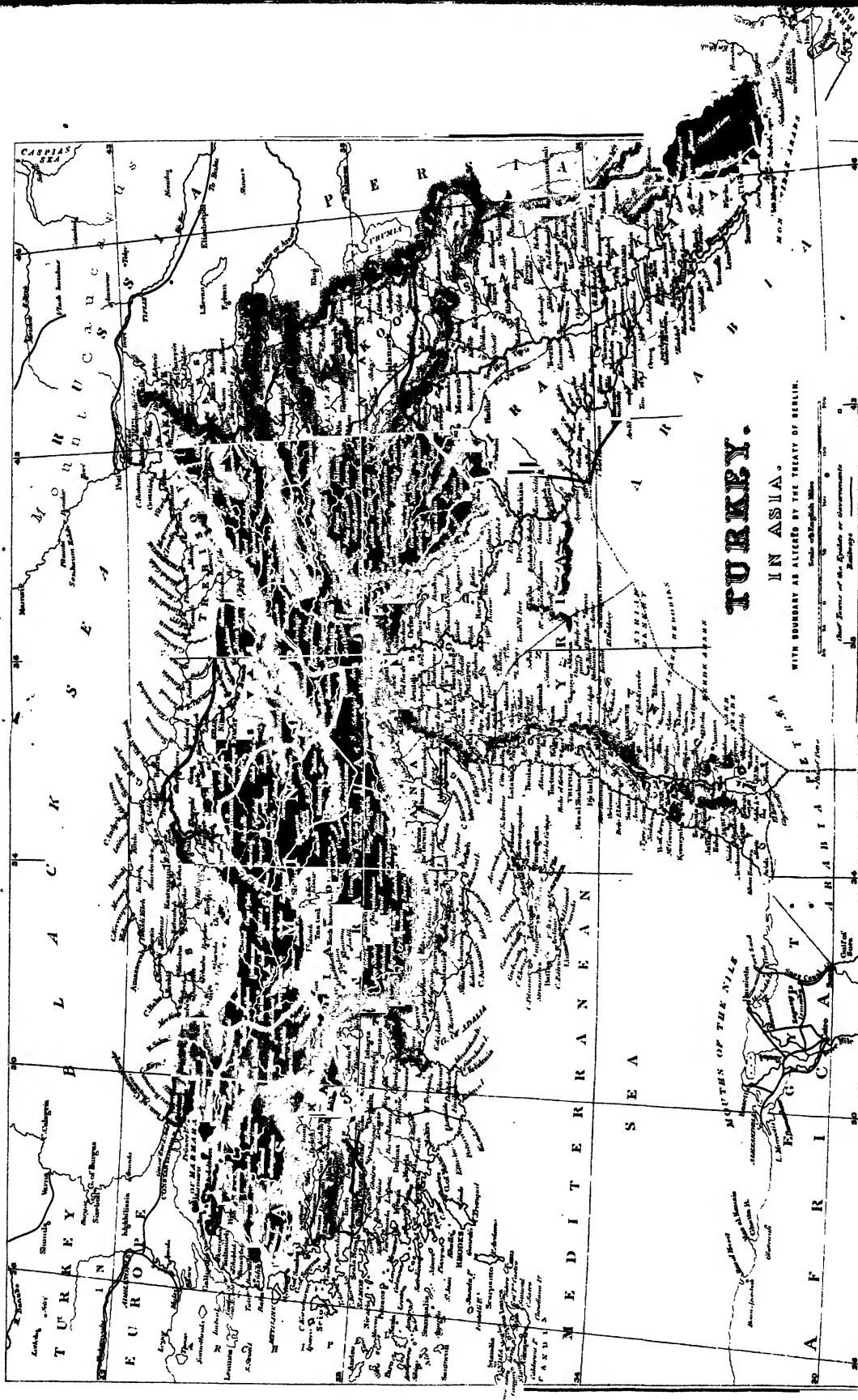












# TURKEY.

IN ASIA.

WITH BOUNDARY AS ALTERED BY THE TREATY OF BERLIN.

Scale of English Miles.

After Treaty of the Berlin or Constantinople Conference.









*Hippopotamus amphibius Hippopotamus*

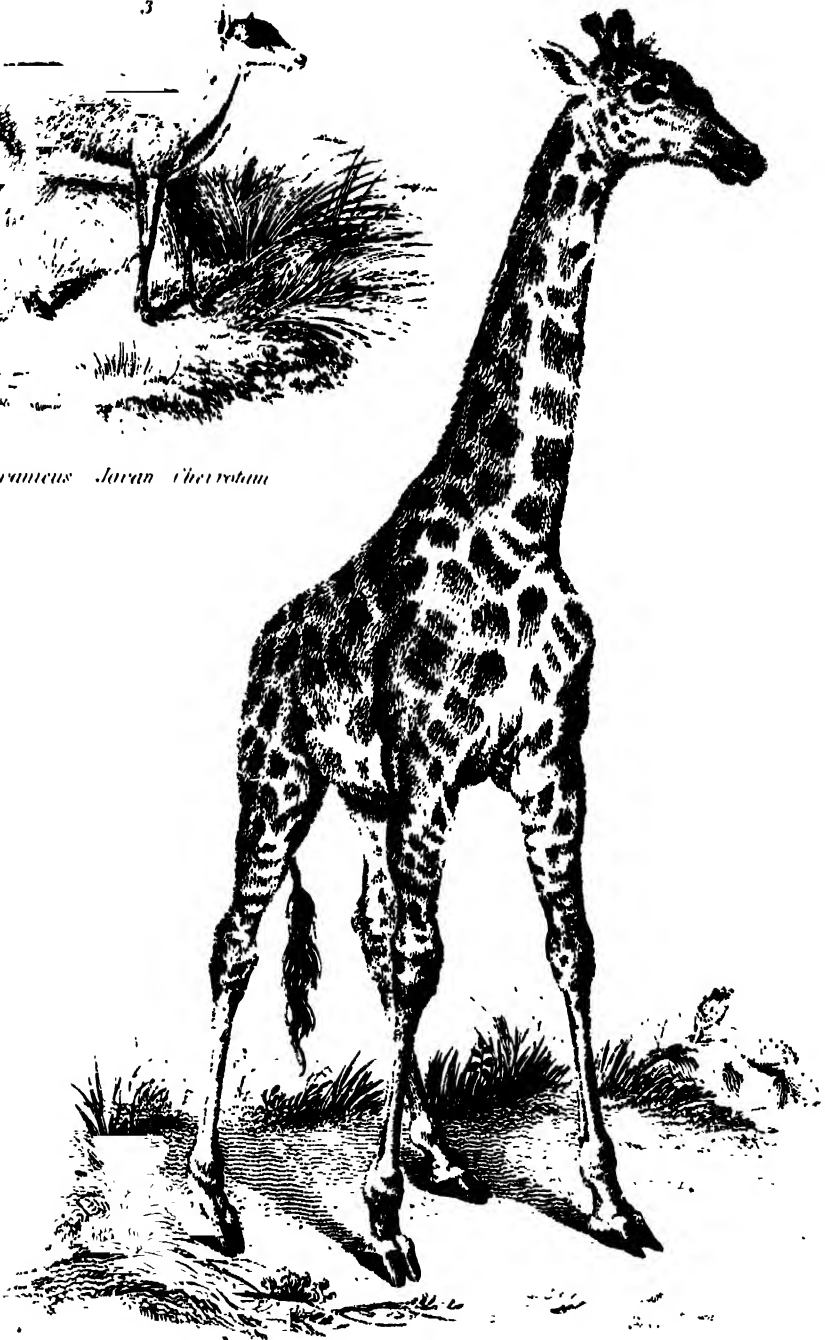


*Camelus dromedarius. Arabian Camel.*





*Tragulus javanicus* Savan. Chetretan



*Camelopardalis giraffa*. Giraffe.

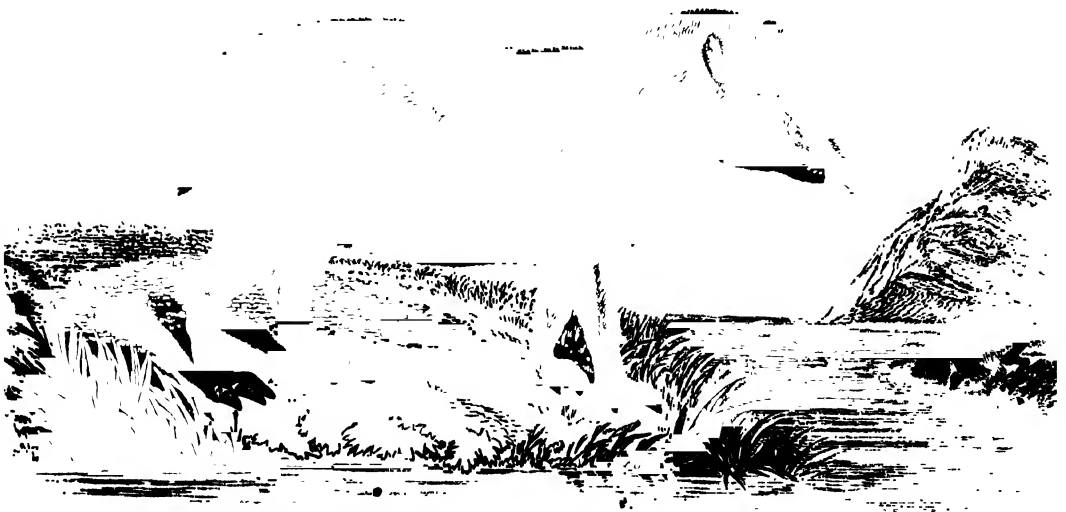




5



*Portax picta* - Nyl. Ghau



*Tapirus americanus* - American Tapir







EASTERN DIVISION OF THE  
**UNITED STATES.**

*Railways already open* —

Scale of English Miles.

100 200 0 200 100











*Salamandra maculosa*,—Spotted Salamander



*Triton cristatus*,—Great Water Newt.



*Menopoma alleghaniensis*,—Hellbender.





*Siren lacertina* — Siren or Mud eel.



*Proteus anguineus*



*Amblystoma mexicanus* — larval form — Scalloth.



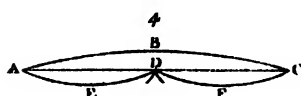
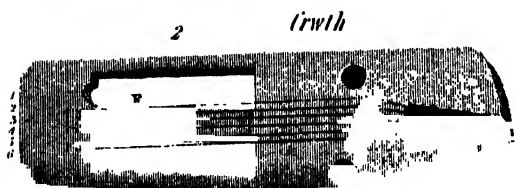
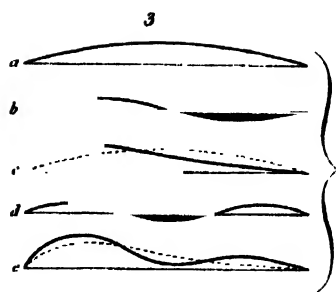
# VIBRATION.

PLATE 1.

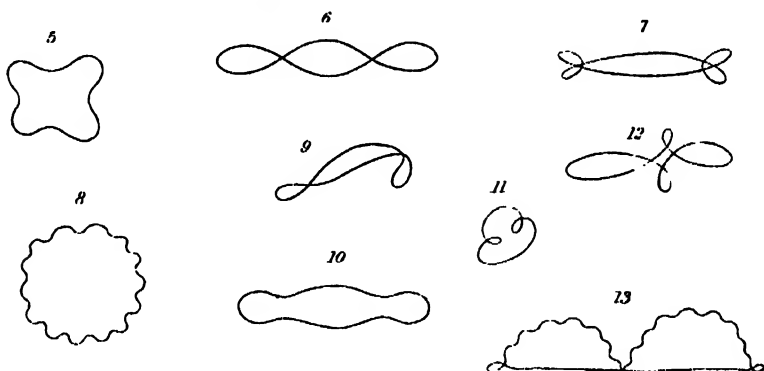
*Violin.*



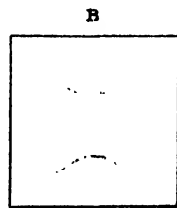
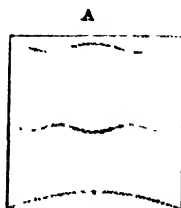
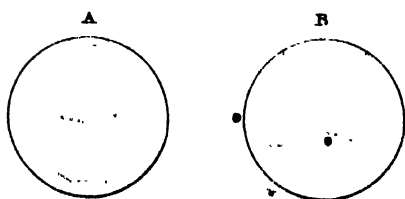
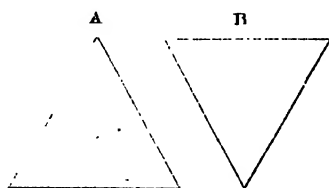
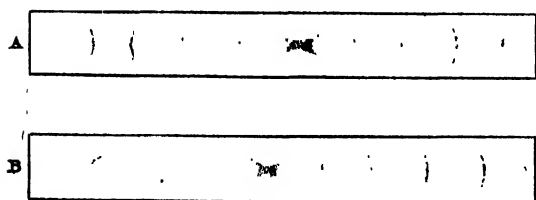
*Vibration of Strings.*



*Closed Curves of the orbit of a Vibrating String.*



*Longitudinal Vibration of rods & plates*

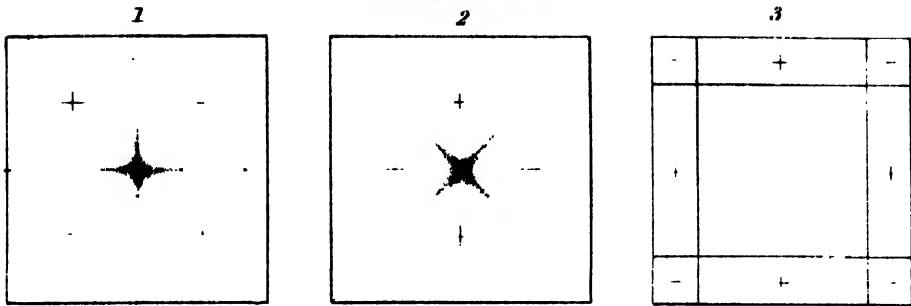




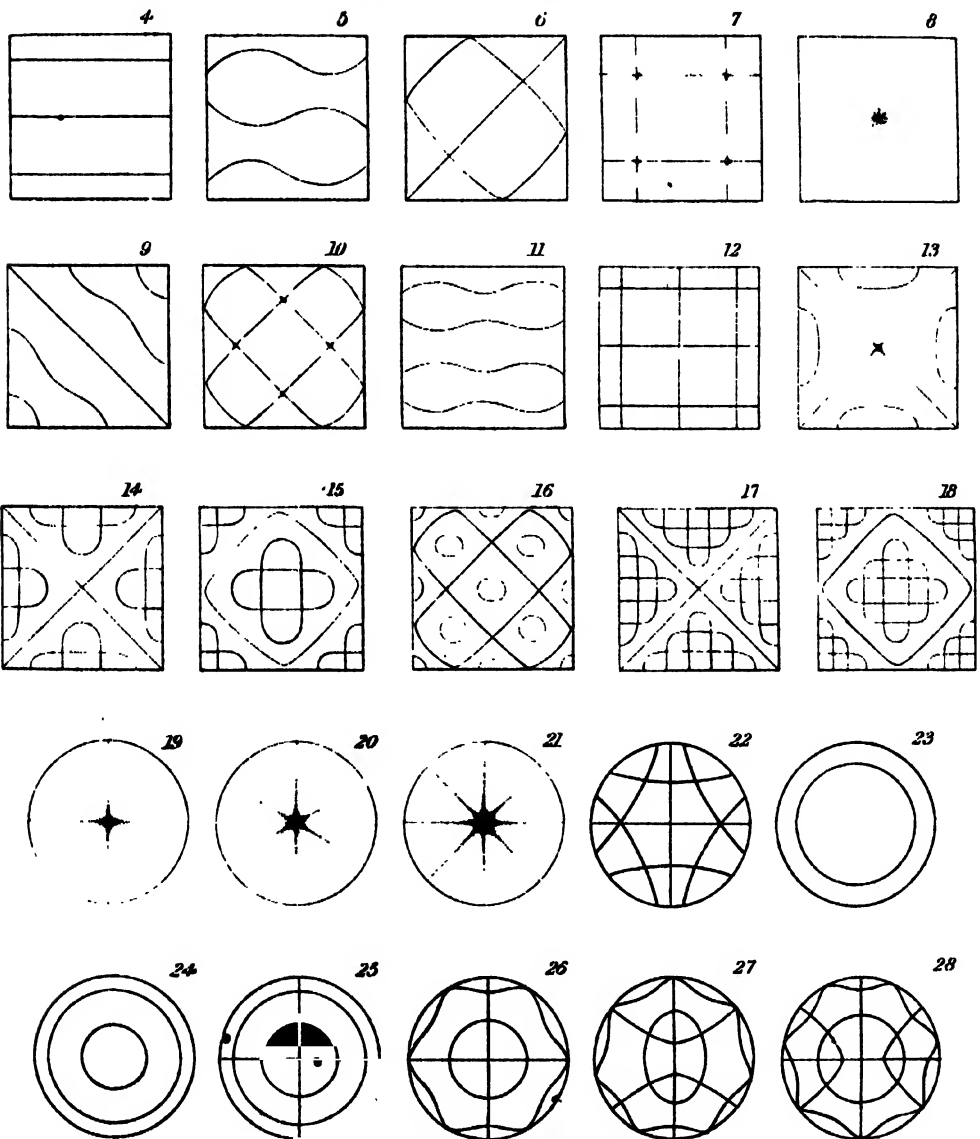
# VIBRATION.

PLATE 2.

*Figures of plates.*



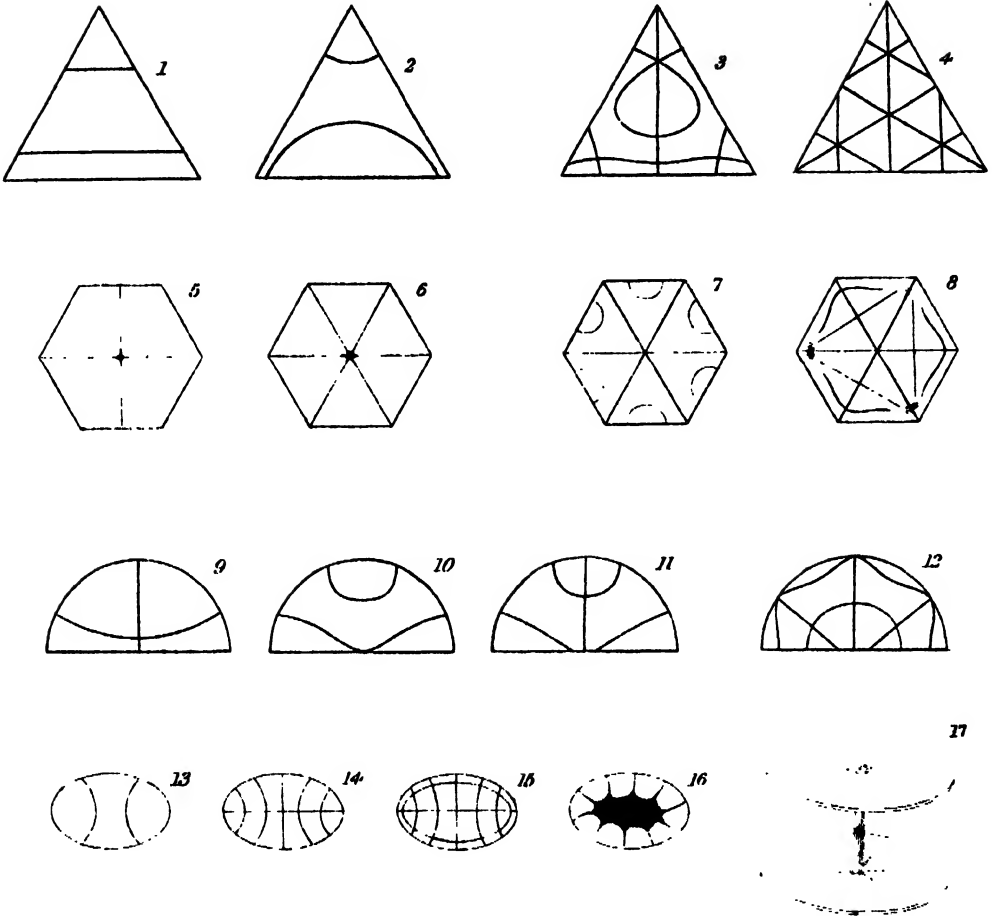
*Chladni's Sand - figures.*



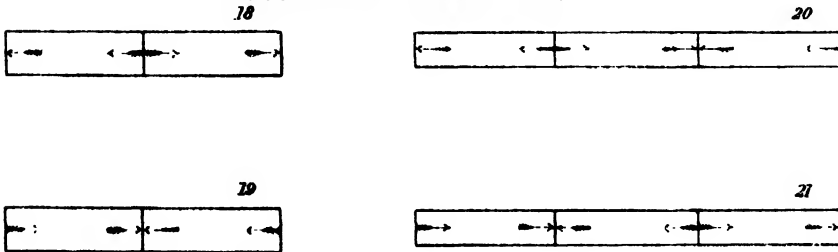




*Chladni's Sand-figures contd.*



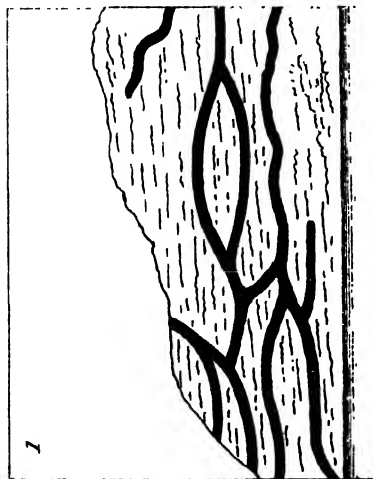
*Vibration of a column of air.*



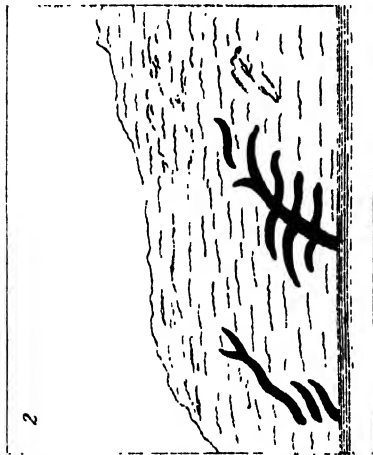
*Longitudinal Vibration of a rod.*



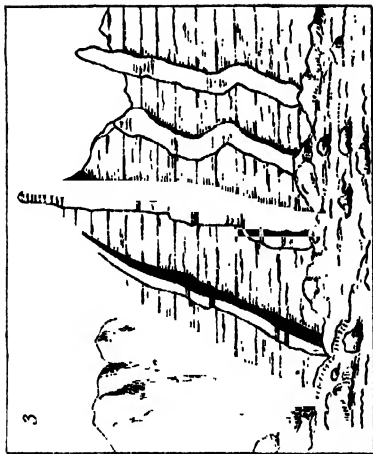




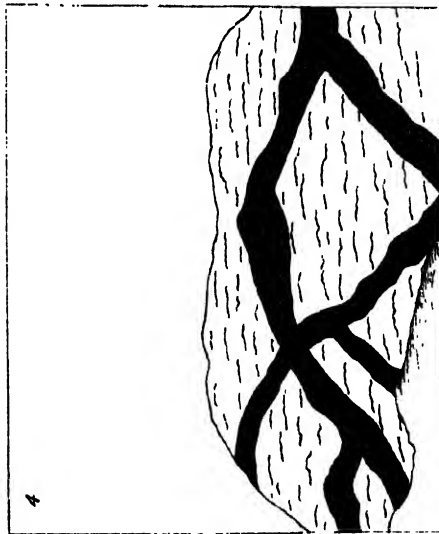
*Tuff penetrated by Dykes of Starchy Lava. Stromboli.*



*Tuff penetrated by Dykes of Starchy Lava. Stromboli.*



*Dykes at the base of the Serro del Solitario. Etna.*



*Dykes of Lava. Punto di Guimeto.*

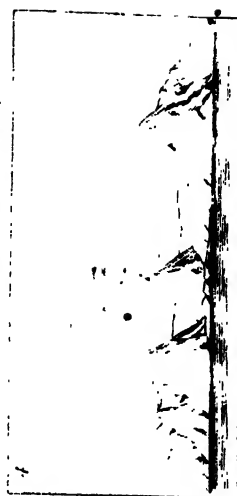
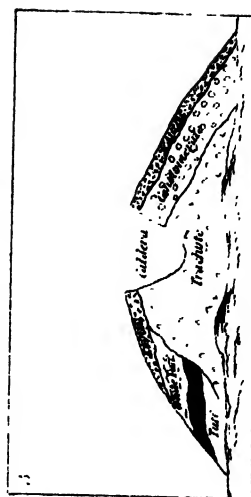
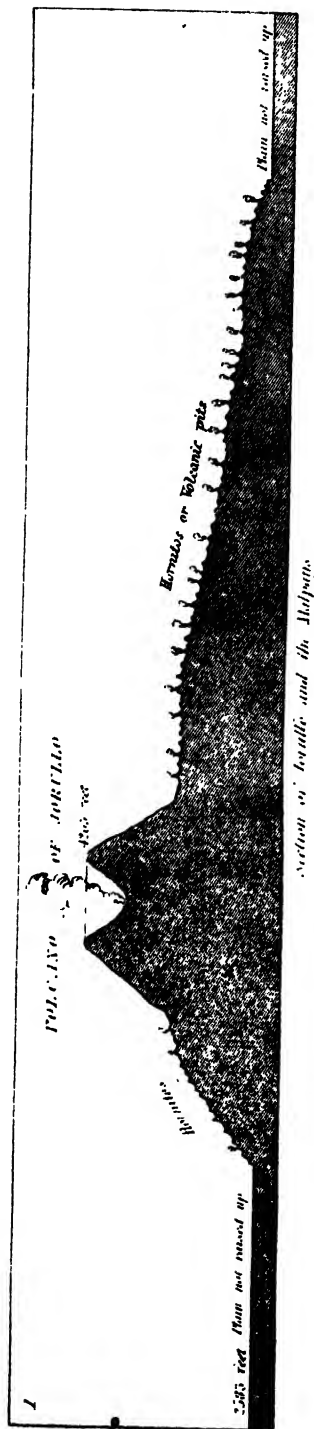


*Dykes of Monte Sennio. Panormus.*



# VOLCANO.

PLATE 2.

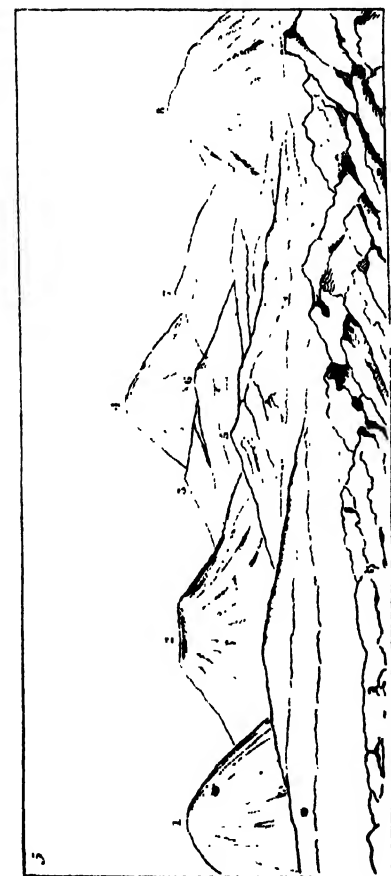


Crater of Fandanus Island or 6<sup>th</sup> Canary.



# VOLCANO.

PLATE 3.



Extinct Volcanoes near Clermont in Auvergne seen from the Puy Chopine

- |                           |                     |                     |
|---------------------------|---------------------|---------------------|
| 1. Grand Sarrasin         | 4. Puy de la Vierge | 7. Grand Niche      |
| 2. Puy de la Vierge       | 5. Puy de la Vierge | 8. Puy de la Vierge |
| 3. Petit Puy de la Vierge | 6. Puy de la Vierge |                     |



Solid grain. (Vulcanism in Mexico 1897) seen from the forest of Chalapa.



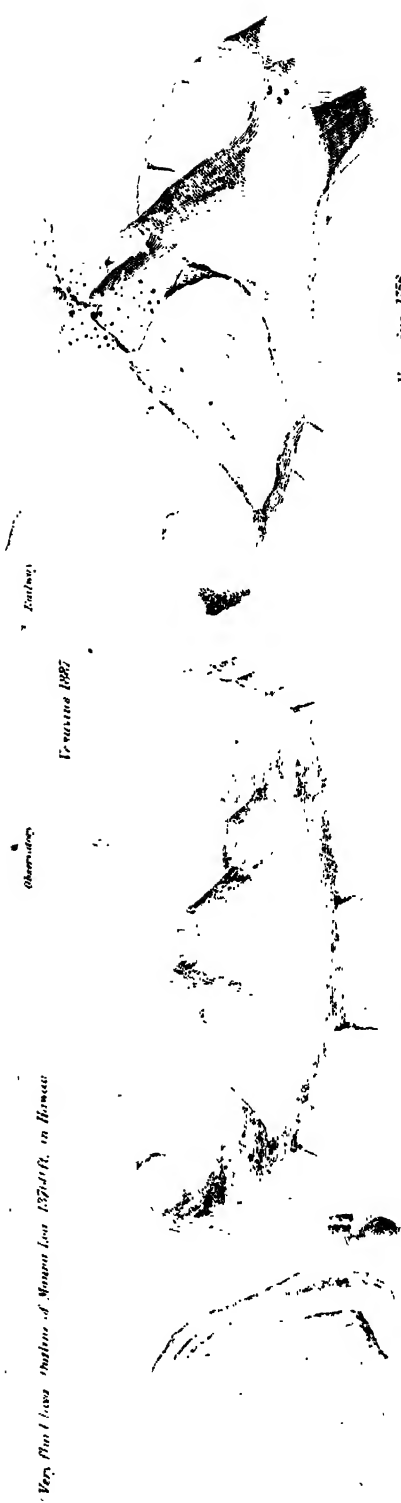
Very fine line

Observed

Endway

Very fine line

Very fine line outline of Mount Vesuvius in Rome



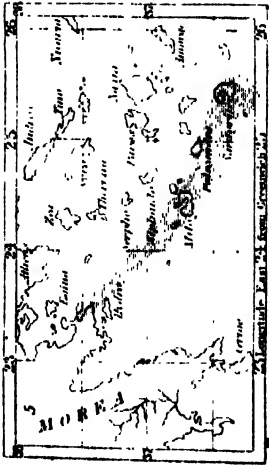
Very fine line

Very fine line

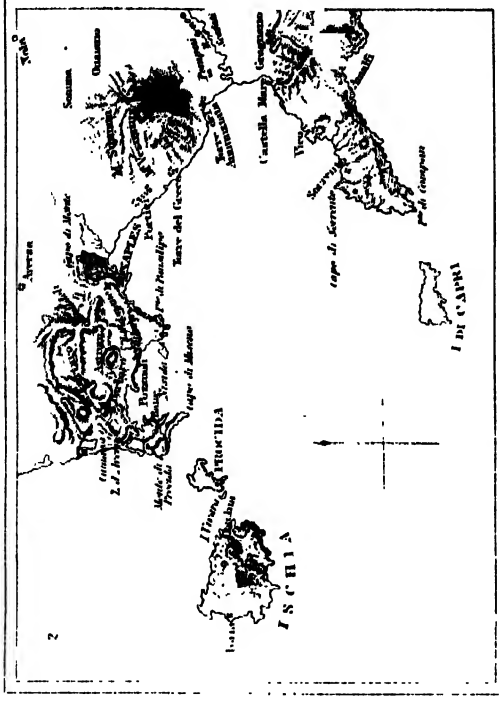
Very fine line



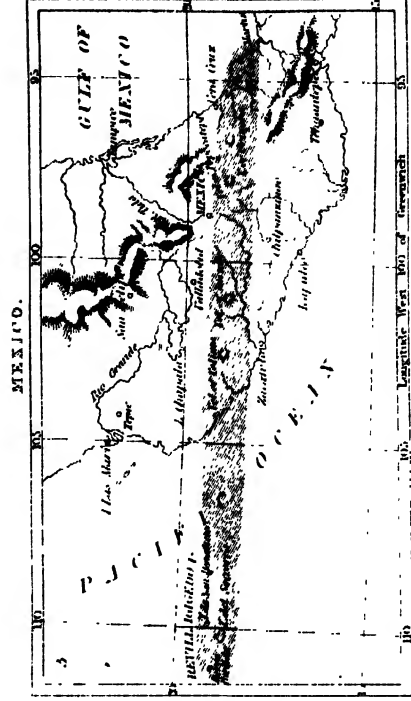
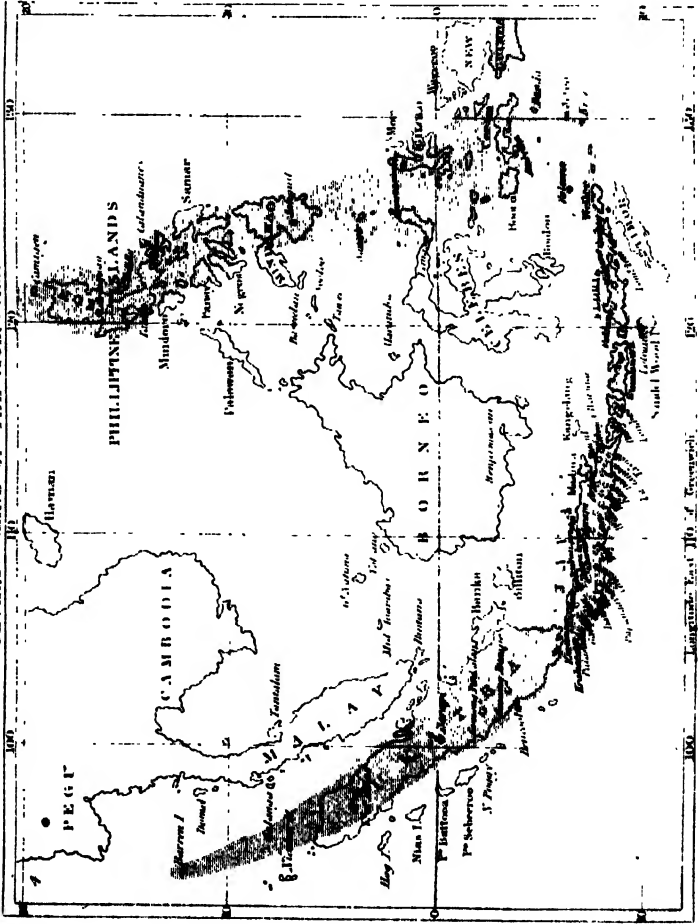




BAY OF NAPLES.



VOLCANIC BAND OF THE MOLLUCAN.





# VOLCANOS.

SOME OF THE PRINCIPAL VOLCANOS OF THE WORLD

PLATE 5.





# VOLITORES

PLATE 1.

2



*Caprimulgus europæus. Common Goat Sucker.*

3



*Merops apiaster. Bee eater.*



*Collocalia nidifica. Edible-nest Swallow. (Esculent Swallow)*



*Cephalolepis delalandi. Flower Crest Humming Bird.*

5



*Eulampis jugularis. Purple-breasted Carib Humming Bird.*





*Pharomacrus mocino.*  
*Quesal or*  
*Long-tailed Trogon.*



*Upupa epops.*

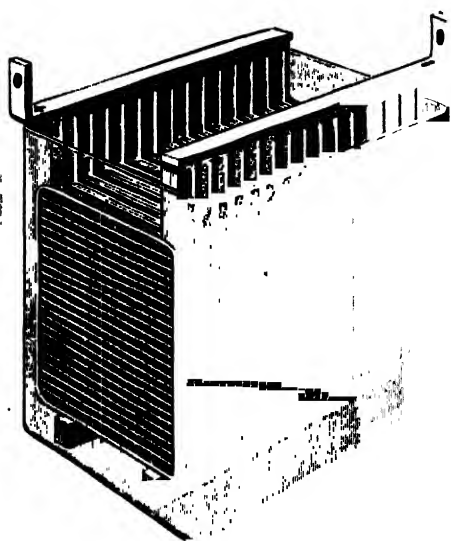
*Ho. p.*



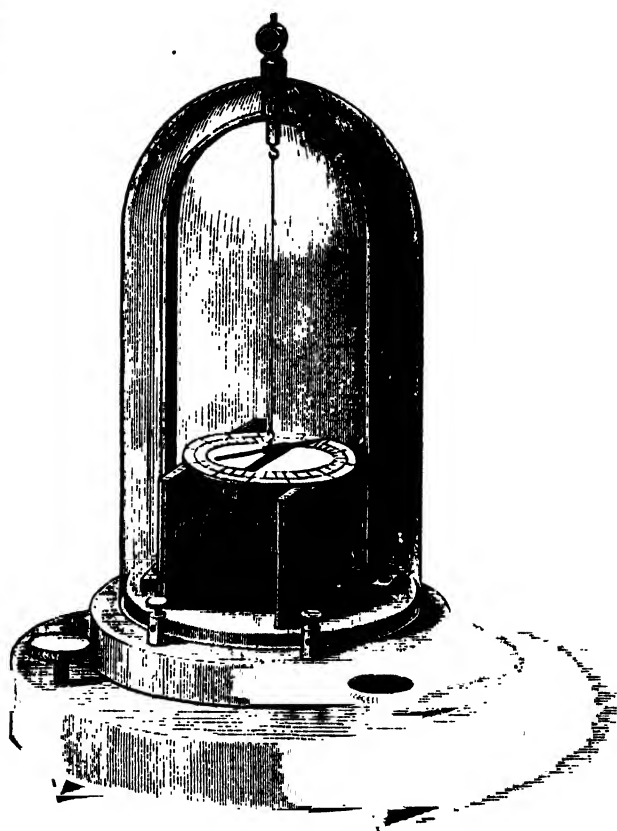
*Galbula leptura. Long-tailed Jacamar.*



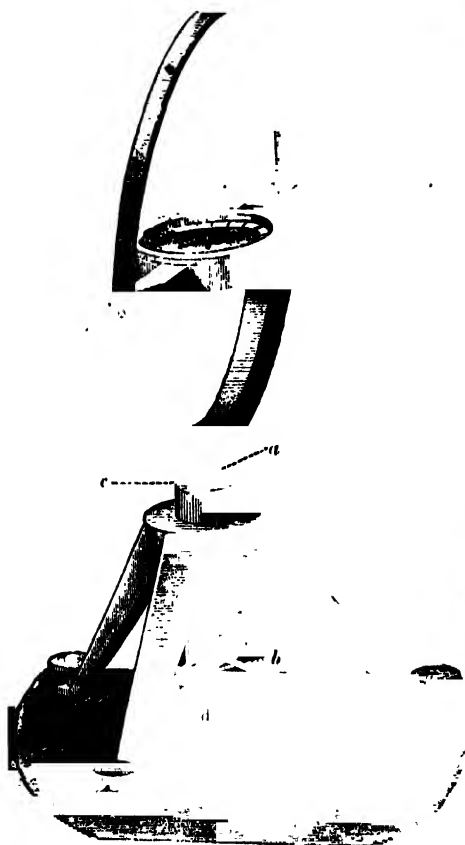




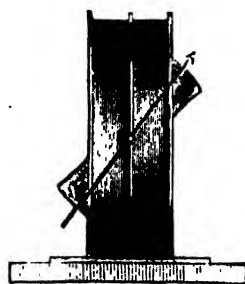
1. Secondary Battery



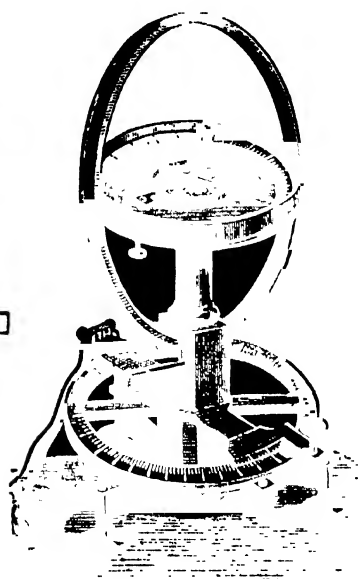
2. Astatic Galvanometer



4. Tangent Galvanometer

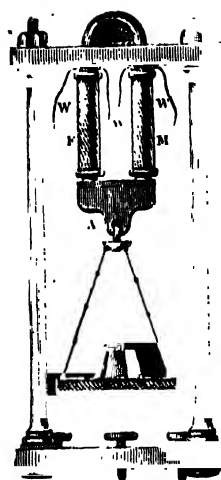


3. Multiplier or Galvanoscope.

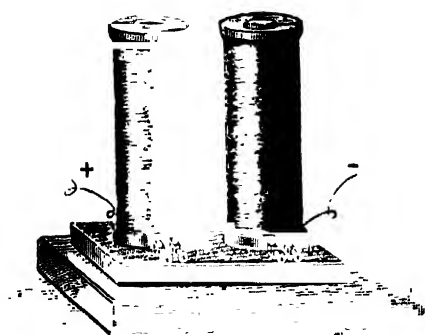


5. Sine Galvanometer.

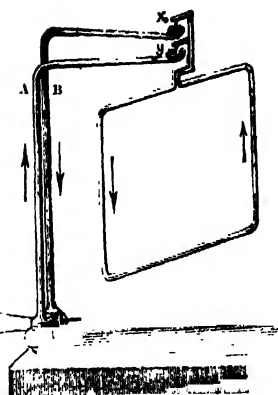




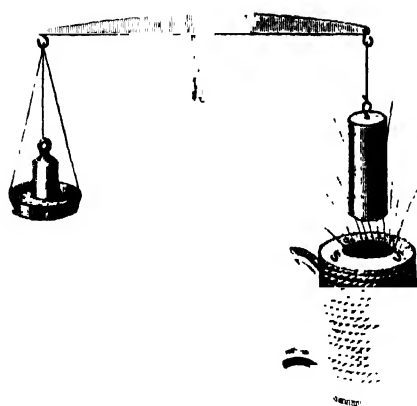
1. *Electro-magnet.*



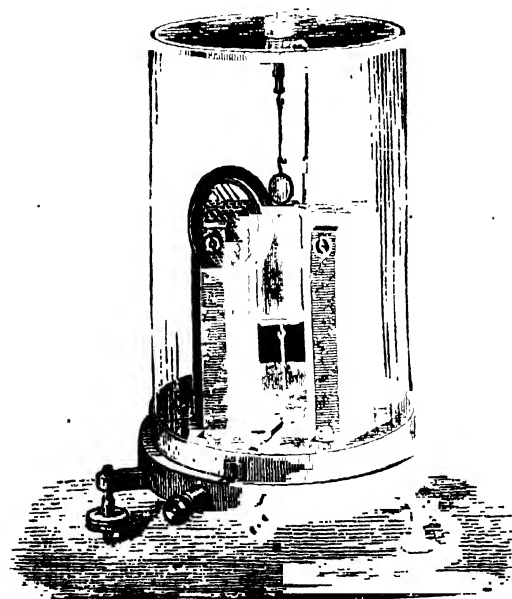
2. *Electro-magnet.*



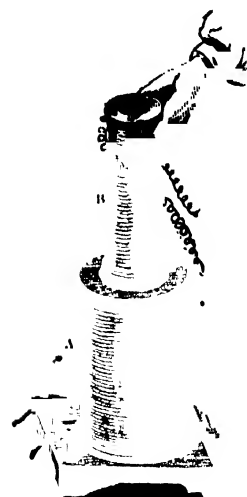
4. *Ampère's Stand.*



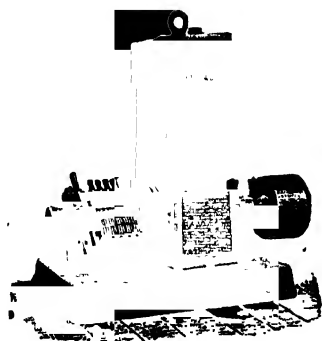
3. *Measurement of Electro-magnetic Attraction.*



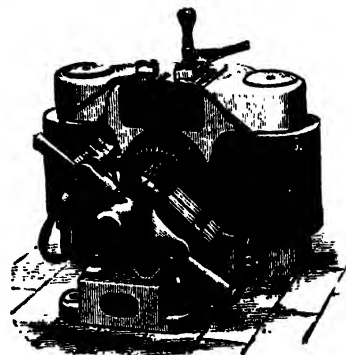
5. *Deprez-D'Arsonval Mirror Galvanometer.*



6. *Primary and Secondary Coils.*  
VOL. 14.

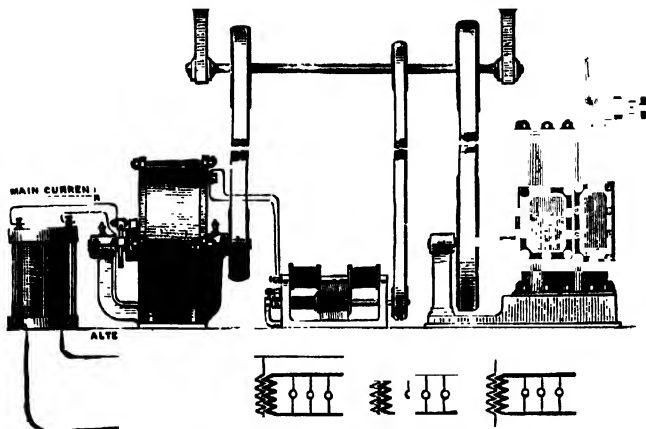


7. *Edison-Hopkinson Dynamo.*

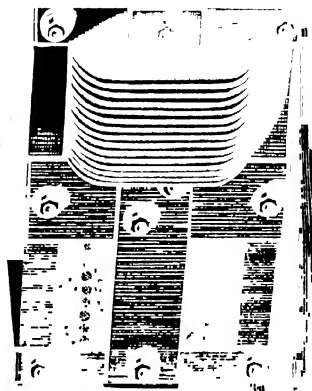


8. *Manchester Dynamo.*

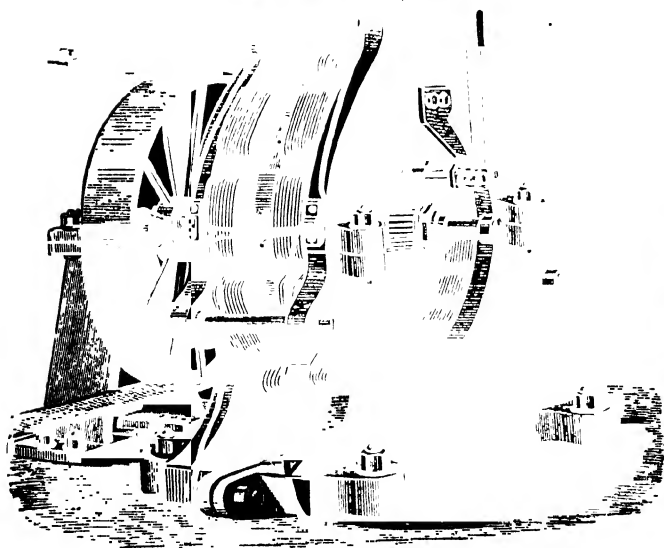




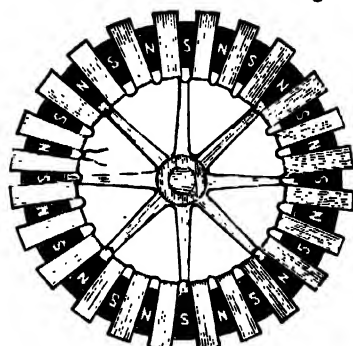
1. Transformer System of Electric Lighting.  
Rankin Kennedy's Arrangement.



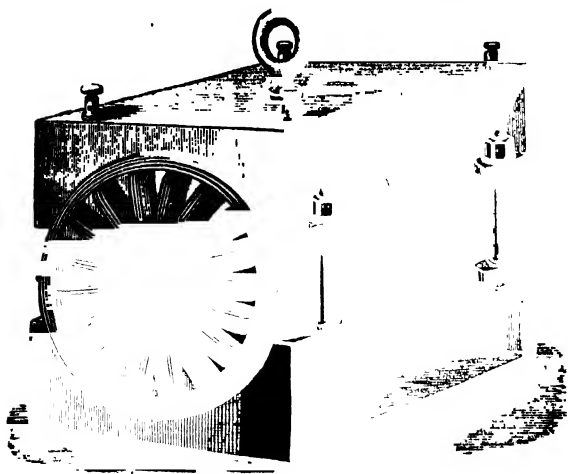
2. Central Station Transformer.



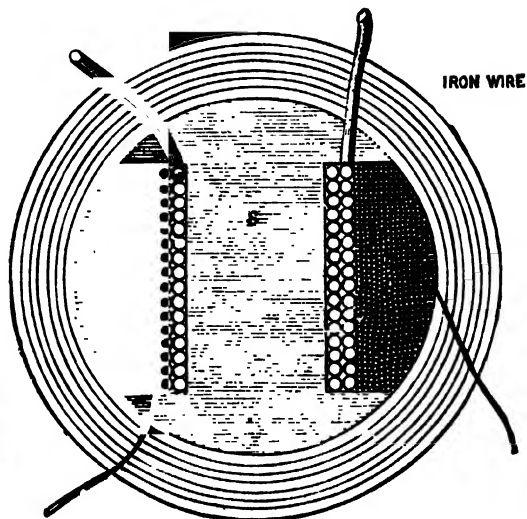
5. Alternating-Current Dynamo.



5a. Armature of Dynamo.



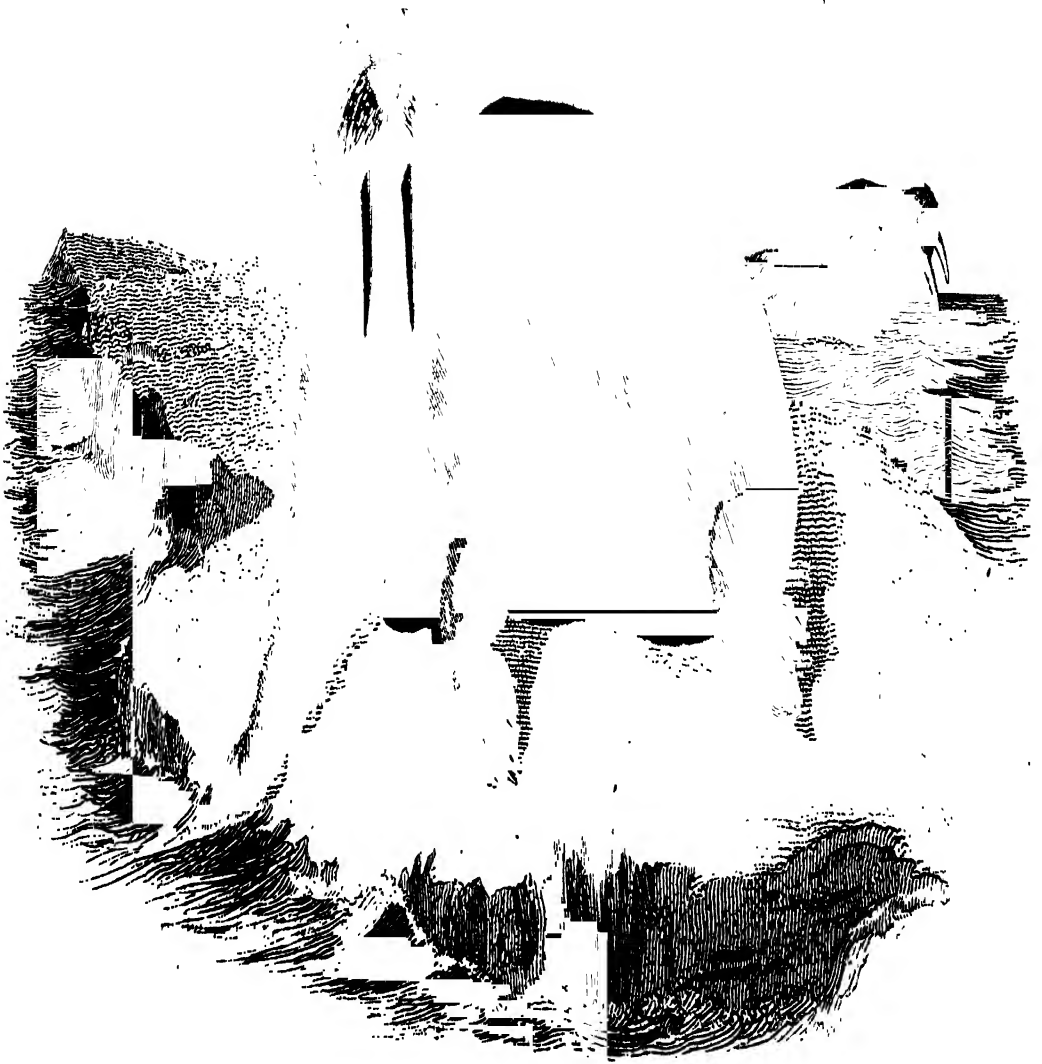
3. House Transformer.



4. Section of Transformer.



# WALRUS.



*Walrus or Morse. Trichechus rosmarus.*

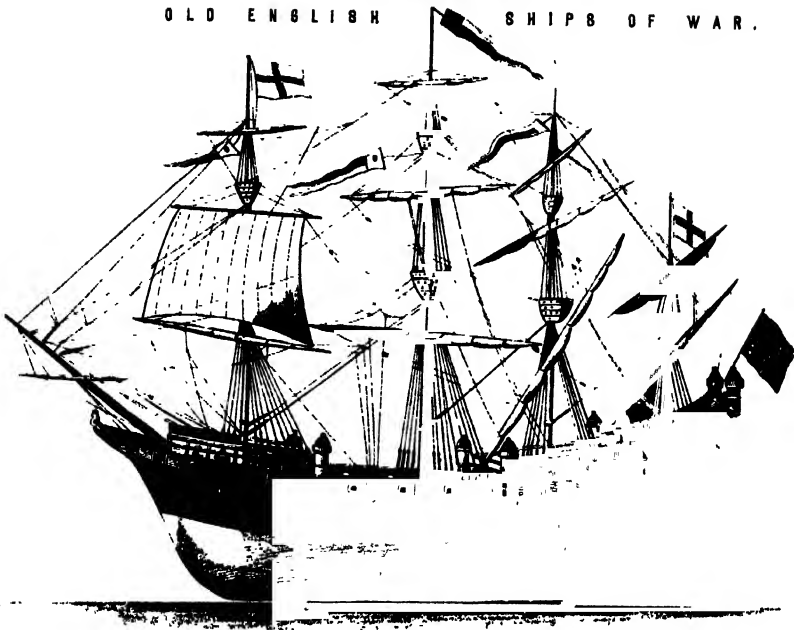




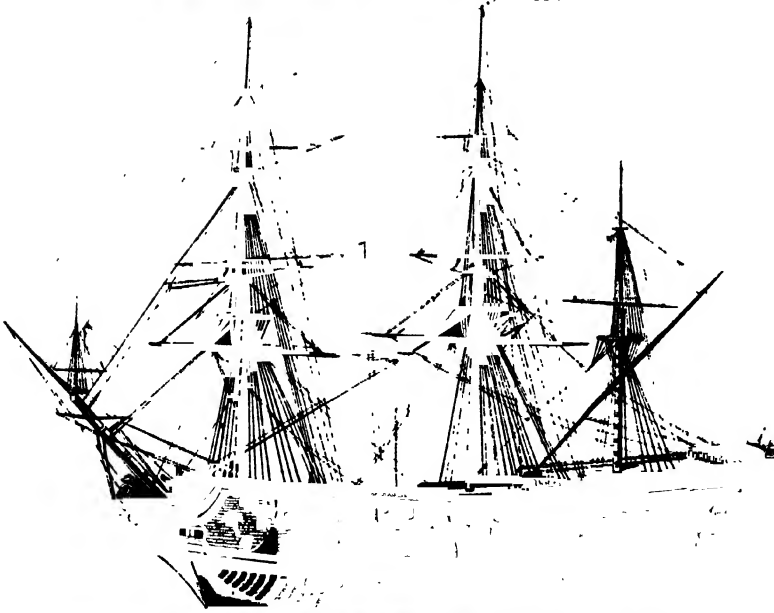
# WAR-VESSEL.

PLATE I

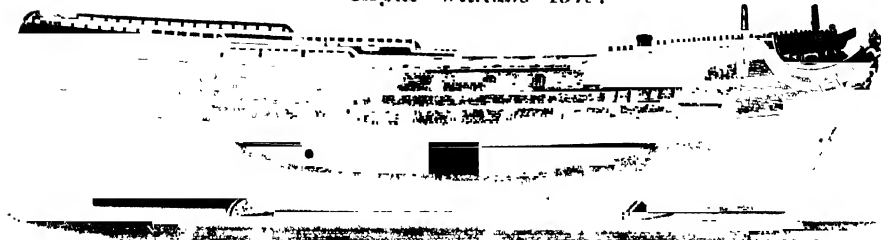
OLD ENGLISH SHIPS OF WAR.



*Great Harry 1514*

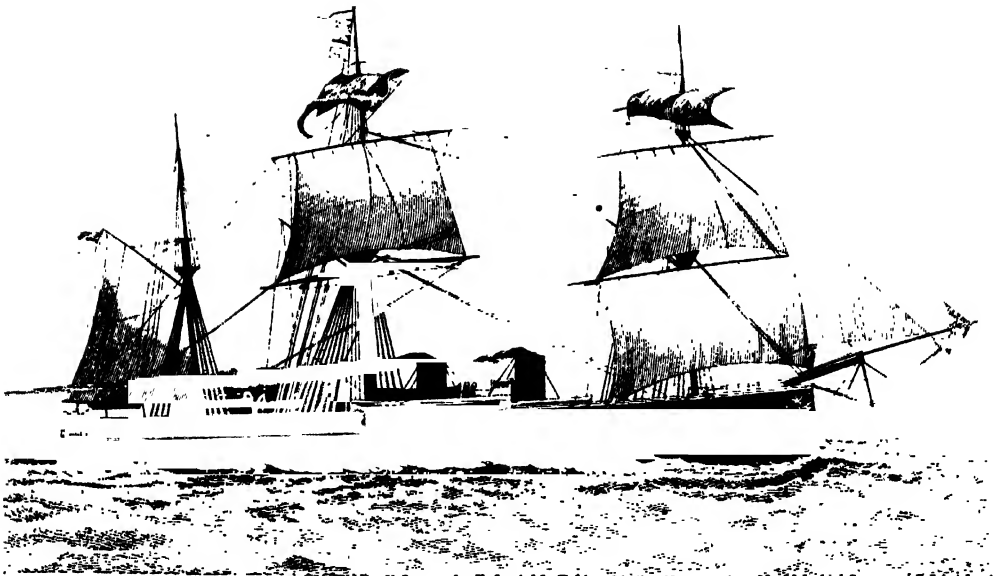


*Royal William 1670.*



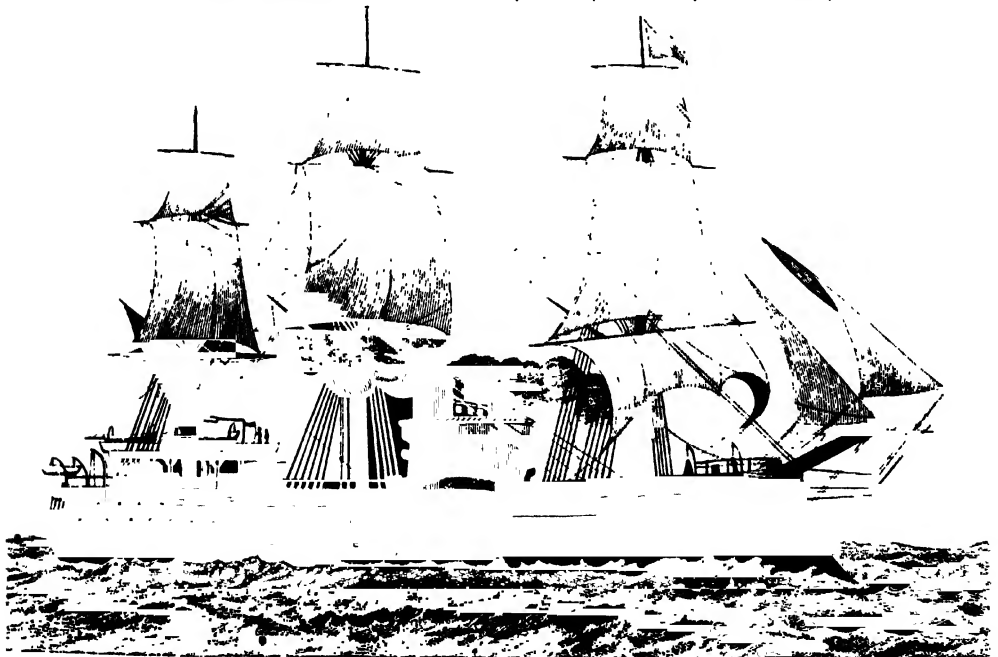
*Sixty-four gun ship 1760.*





*Alexandra, 9490 tons 8610 H. P.*

*2 (25 ton) M. L. R. guns, 10 (13 ton) do 11 light 4 quick firing, 35 machine guns*



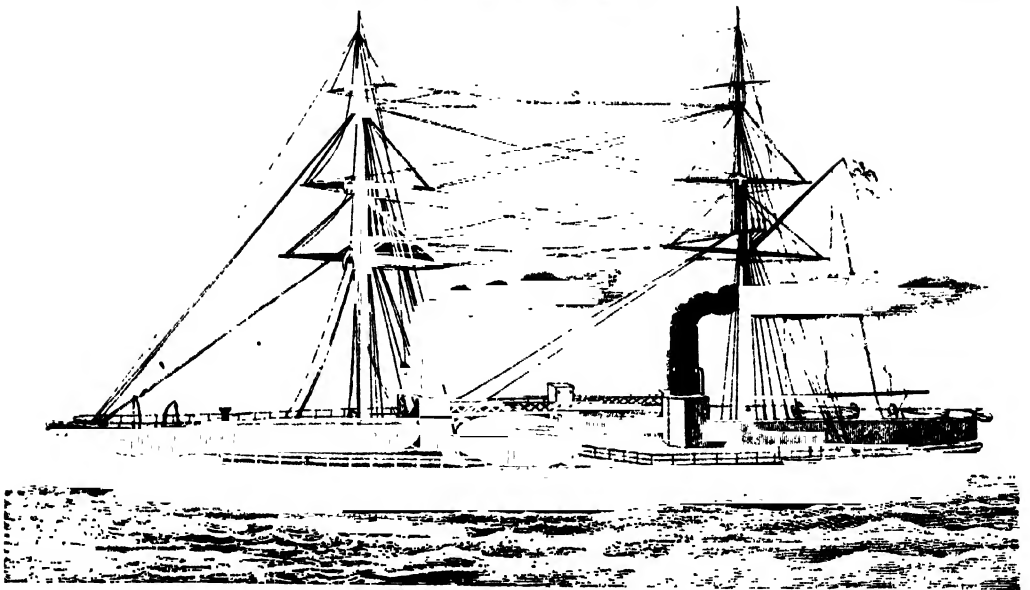
*Amiral Duperre, 11,100 tons, 8000 H. P.,*

*4 (48 ton) B. L. R. guns, 14-16 in 5 do 12 machine guns.*

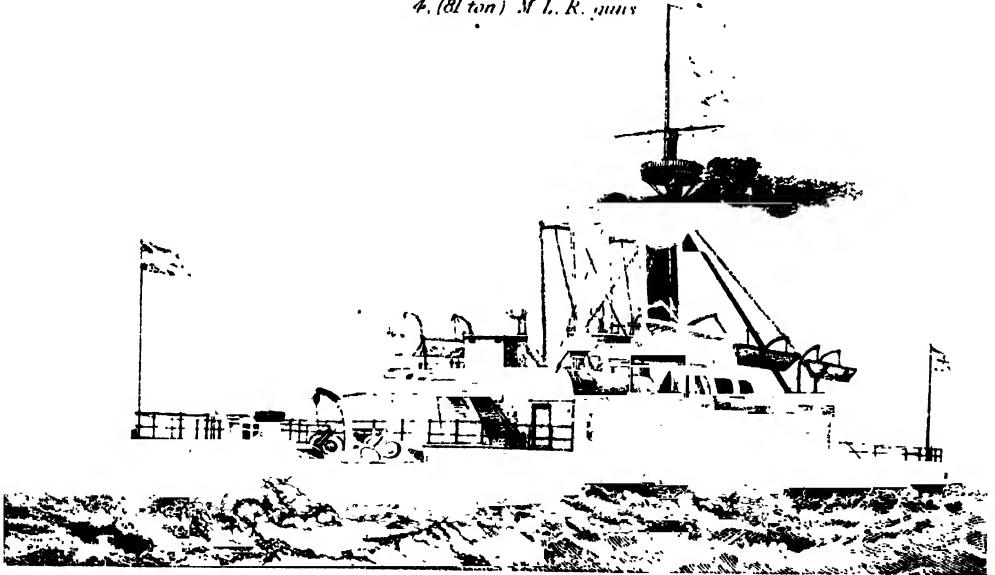
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# WAR-VESSEL.

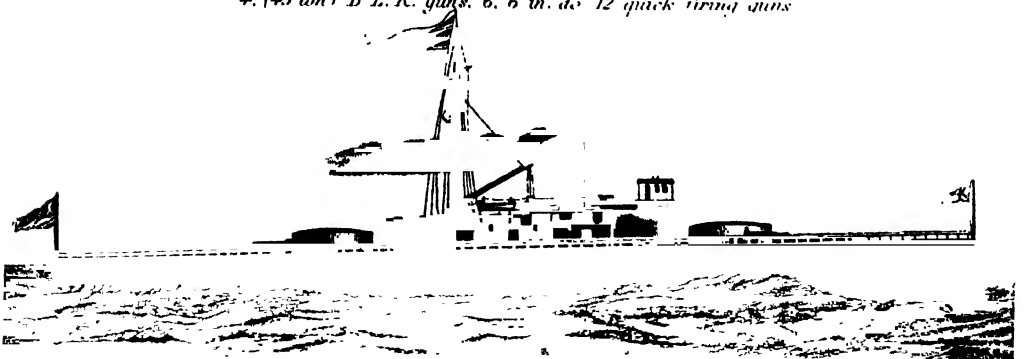
PLATE 3.



1. *Intrepid*, 11,880 tons, 8010 H.P.  
4. (81 ton) M. L. R. guns

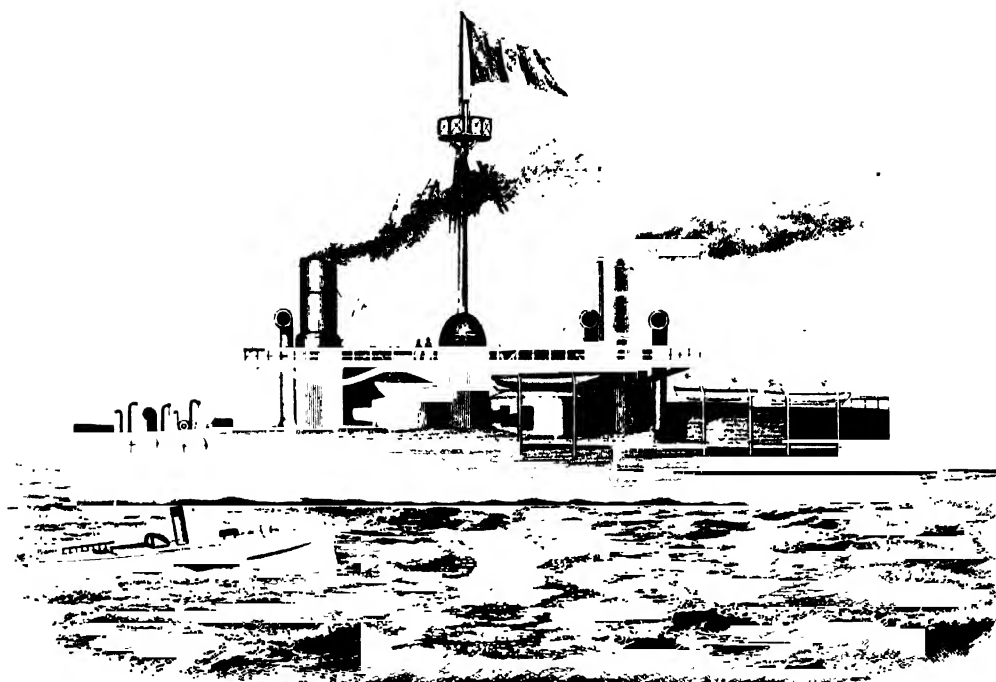


2. *Collingwood*, 9150 tons, 9570 H.P.  
4. (43 ton) B. L. R. guns, 6. 6 in. do 12 quick firing guns



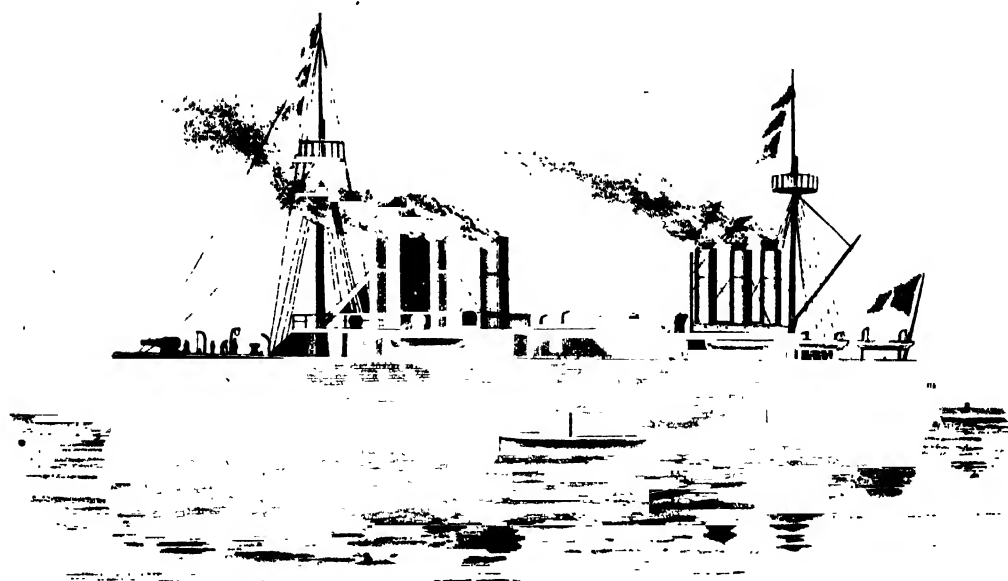
3. *Trufolgar*, 11,940 tons, 12,000 H.P.  
4. (68 ton) B. L. R. guns & 5 in. A.





*Ducho, 10,570 tons, 7500 H. P.*

*4, 100 ton M. L. R. guns 6 light & 12 machine guns*



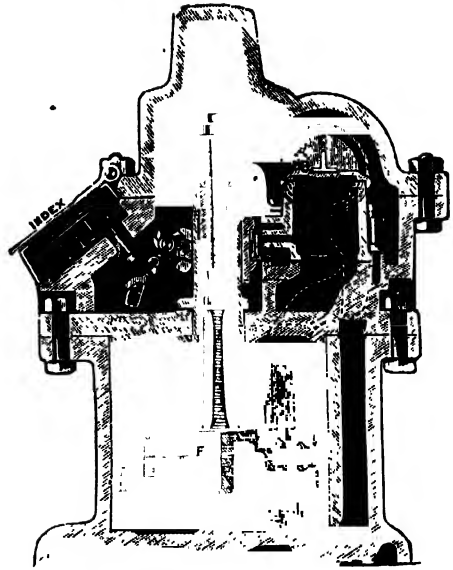
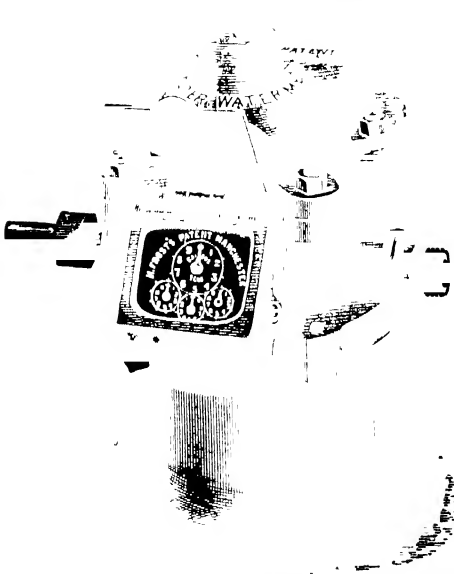
*Italia, 13,851 tons, 18,000 H. P.*

*4, (110 ton) B. L. R. guns, 8, 6 in. dr. 6 light & 14 machine guns.*

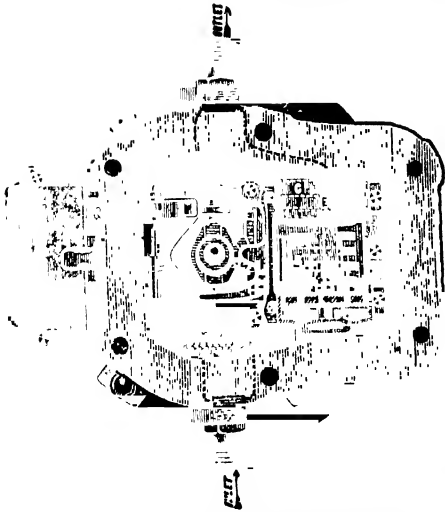




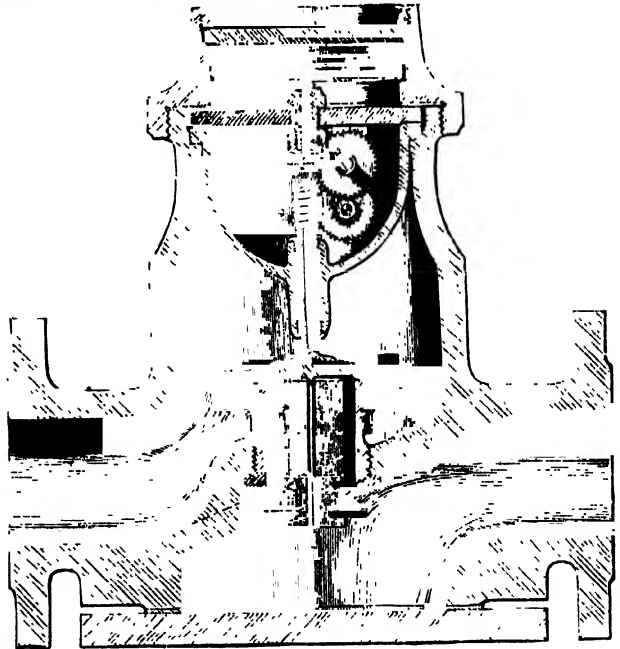
# WATER-METER.



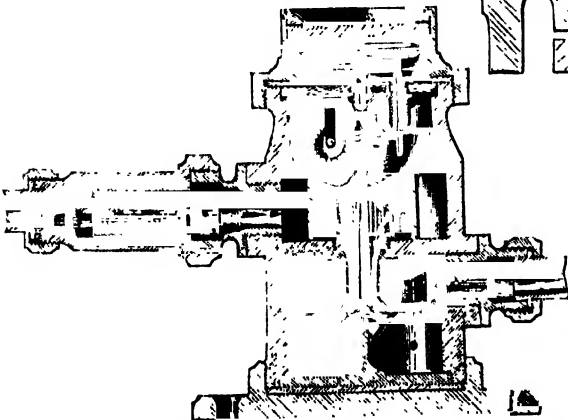
1 Elevation; 2, Vertical Section.—Frost's Piston Water-meter.



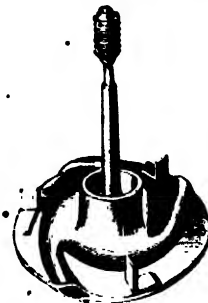
3, Frost's Water-meter—Horizontal Section.



4, Siemens' Large Water-meter.



5, Siemens' Turbine Water-meter.



6, Turbine.



7, Section of Large Turbine.











# LIST OF PLATES.

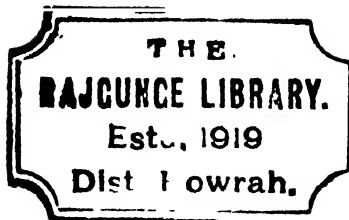
## VOL. XIV.

*To be Bound at Commencement of Volume in Following Order.*

VENETIAN ARCHITECTURE,	. . .	<i>To face Title, VOL. XIV.</i>
TUNNEL,	. . . . .	PLATE I.-IV.
TURBINE,	. . . . .	„ I.
TURKEY IN EUROPE,	. . . . .	COLOURED MAP.
TURKEY IN ASIA,	. . . . .	„
TURNING LATHES,	. . . . .	PLATE I.
UNGULATA,	. . . . .	„ I.-III.
UNITED STATES (EASTERN DIVISION),	. . .	COLOURED MAP.
„ (WESTERN DIVISION),	. . .	„
URODELA,	. . . . .	PLATE I.-II.
VIBRATION,	. . . . .	„ I.-III.
VOLCANO,	. . . . .	„ I.-V.
VOLITORES,	. . . . .	„ I.-II.
VOLTAIC ELECTRICITY,	. . . . .	„ I.-III.
WALRUS,	. . . . .	„ I.
WAR-VESSELS,	. . . . .	„ I.-IV.
WATER METER,	. . . . .	„ I.
WORLD (PHYSICAL MAP OF),	. . . . .	COLOURED MAP.







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THE

# NATIONAL ENCYCLOPÆDIA:

A DICTIONARY OF

## UNIVERSAL KNOWLEDGE.

### TRIFOLIUM.

**TRIFOLIUM.** See CLOVER.

**TRIFORIUM**, a Latinized form of *thoroughfare*, applied to the upper galleries formed by small open arches above those dividing the nave from the side-aisles of a church, and beneath the clerestory windows, this intermediate tier being within the sloping roof over the aisles. [See the triforium shown in the sketch of Durham Cathedral nave, Plate I., ENGLISH CATHEDRAL ARCHITECTURE.] In general the triforium is very shallow or narrow, and the arches in front of it small and low; but there are great differences in these respects even in buildings of the same period and character.

**TRIGGER-FISH.** See FILE-FISH.

**TRIGLYPH** (Gr. *triglyphos*, thrice-cloven), in architecture, an ornament of the frieze in the Doric style, consisting of two entire and two half channels, separated by flat spaces called *femora*, and supposed to represent the ends of the beams in the original temples of wood. See GREEK ARCHITECTURE.

**TRIGONELLA** is a genus of plants belonging to the order LEGUMINOSÆ, suborder Papilionaceæ. The species are herbs, widely distributed over Southern Europe, Western and Central Asia, and Northern Africa; none are found in Britain. *Trigonella Fœnum-Græcum* (the common Fenugreek) is a native of the south of Europe, and is also found on the coast of Asia Minor. In some parts of the south of Germany it is extensively cultivated as fodder for horses and sheep. It does not, however, appear adapted for the climate of Britain, on account of the uncertainty of the weather. The seeds, which have a strong peculiar odour, were formerly employed by the Greeks and Romans in medicine, and are now sometimes used in this country in veterinary practice. They are also used for flavouring cattle foods, and for rendering damaged hay palatable. *Trigonella esculenta*, is a native of some parts of India, where its legumes are eaten by the natives as food.

**TRIGONOMETRY.** This word, strictly speaking, signifies the measurement of triangles, but we might as well attempt to confine geometry within etymological limits as trigonometry.

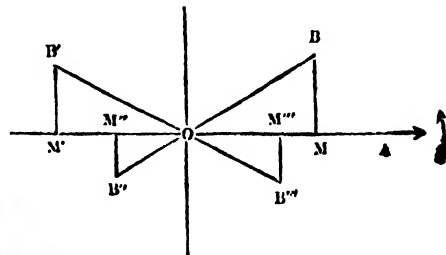
In the modern division of the mathematical sciences, trigonometry, though still defined in books as the art of measuring triangles, really means the consideration of alternating or periodic magnitude; in which quantity is imagined to go through alterations of increase and diminution without end.

VOL. XIV.

### TRIGONOMETRY.

The most simple notion of periodic magnitude lies in supposing that the changes made are purely cyclical, or repetitions of the same for ever; as for instance, those which occur in turning a handle in a vertical plane. The number of revolutions traced out by the handle may be as great as we please; and the quantity of length of the circular arc described by its extremity may be as many times the circumference of the circle as we please—that is, as long as we please; but the distance of the handle from the ground is periodic, exhibiting perpetual increase and diminution as it rises and falls. Hence the circle naturally becomes a sort of standard of reference, and circular motion the primary idea, in all considerations of periodically changing magnitude. The arc, or the angle which it subtends at the centre, is the magnitude which increases without limit, all past revolutions being counted; and the lines which only depend on the position of the moving point in the circle, and not on the number of revolutions by which it has attained that position, are the periodic magnitudes in terms of which all others are expressed.

The periodic magnitudes connected with a varying angle, so far as they have separate designation, are the sine, cosine, tangent, cotangent, secant, cosecant, versed sine, coverbed sine, and chord. A change is gradually taking place in the mode of conceiving these quantities, and one which it is very desirable to expedite: though



slight in appearance, and producing no difference in results, it gives a great advantage in the consideration of formulae. These elements were lines: they now often are, and in time always will be, the ratios of lines to lines.

From any point in the line OB (or OB', &c.), which is one boundary of the angle AOB, draw BM (or B'M', &c.)

perpendicular to O A, the other boundary. Let O M and M B be positive, O M' and M' B' &c., negative, as in the usual method of reckoning co-ordinates. Call B M, B' M', &c., "opposite" to the angles, and O M, O M', &c., "adjacent;" and let O B, O B', &c., be called "hypotenuses" (and always considered positive). Then the sine of B O M is the fraction which B M is of O B, with its proper sign, in this case positive; but the sine of A O B" is the fraction which M' B" is of O B", taken negatively, because M' B" is negative. It is indifferent what hypotenuse is taken, by the property of similar triangles, and the following is the complete system of definitions, with the values written for the four angles. They give a slight degree more trouble at first, which is amply compensated in the superior ease with which all formulæ may be deduced, to say nothing of the advantage of avoiding the indefinite radius.

Definition.	A O B	A O B'	A O B"	A O B'''
Sine =	Oppos. side	B M	B' M'	B'' M''
	hypotenuse	B O	B' O	B'' O
Cosine =	Adjac. side	O M	O M'	O M''
	hypotenuse	O B	O B'	O B''
Tangent =	Oppos. side	M B	M' B'	M'' B''
	Adjac. side	M O	M' O	M'' O
Cotangent =	Adjac. side	M O	M' O	M'' O
	Oppos. side	M B	M' B'	M'' B''
Secant =	hypotenuse	O B	O B'	O B''
	Adjac. side	O M	O M'	O M''
Cosecant =	hypotenuse	B O	B' O	B'' O
	Oppos. side	B M	B' M'	B'' M''

versed sine = unity - cosine.  
Covered sine = unity - sine.

The chord has long ceased to be regarded as one of the trigonometrical functions, and is always used in its old sense, as the line joining the extremities of an arc.

The old-fashioned way of studying trigonometry, as above stated, was by considering the relations of lines rather than of ratios, and since this view is still very frequently adhered to, and even more frequently referred to, it is necessary to state the trigonometrical functions in the form of lines. Take any angle, B C H, and regard the vertex of the angle as the centre of a circle; then describe

is the "circle of reference." Now from one of the points of section let fall a perpendicular on the other leg of the angle; for example, from the point B let fall B D perpendicular to C H. This perpendicular, B D, is the *sine* of the angle B C H, and the parts into which it cuts the radius C H are called the *cosine* and the *versed sine*, the cosine being C D, the part towards the centre of the circle of reference, and the versed sine being D H, the part towards the circumference of the same circle. It is a property of circles that a line drawn at right angles to a radius of the circle, at the extremity of it, will be a tangent to the circle—that is, will touch it without cutting it. Consequently if we draw H G at right angles to C H (and therefore parallel to the sine B D), H G, which cuts the other leg of the angle in G, will be the *tangent* of the angle B C H. The part it cuts off, C G, is called the *secant*, as this line intersects the circle of reference in the point B. As there is a cosine, so are there also a cotangent and a cosecant. The first is found by drawing a radius, C F, of the circle of reference at right angles to C H, the radius whence the tangent H G was drawn, and from F, the extremity of this new radius, drawing F I at right angles to it, and cutting the other leg of the angle at the distant point I. F I is therefore a tangent to the circle of reference, and it is the *cotangent* to the angle B C H. And just as the secant meets the tangent, so does the *cosecant* C I meet the cotangent F I. The *complement* of the angle B C H is the angle B C F, which makes up its defect from one right angle, and the *supplement* of the angle B C H is the angle B C A, which makes up its defect from two right angles. The trigonometrical functions of the complement of an angle are the "co-functions" of the angle itself, and *vice-versâ*. It is at once manifest from the figure that B E = C D and B E is the sine of B C F, whilst C D is the cosine of B C H. So also H G is the tangent of B C H, and the cotangent of its complement B C F. On the other hand the functions of any angle are also the functions of its supplement, for in the figure B D is the sine of B C A, as well as of B C H, since it is a perpendicular dropped from B upon A C produced. So also is it with all the other functions.

Applying the known properties of right-angled triangles (that the square of the hypotenuse is equal to the combined squares of the sides containing the right angle), and calling C B (or C H or C F) the radius, we get at once the three equations—

$$\begin{aligned}\sin^2 + \cos^2 &= \text{Rad}^2, \\ \tan^2 + \text{Rad}^2 &= \text{Sec}^2, \\ \cotan^2 + \text{Rad}^2 &= \text{Cosec}^2.\end{aligned}$$

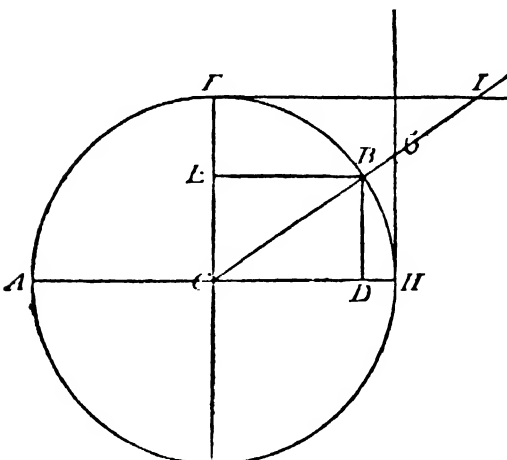
Further, from the properties of similar triangles we get the following four series of proportionals:—

$$\begin{aligned}\text{Tan} : \text{Rad} &:: \text{Sin} : \text{Cos} \quad (\text{G H} : \text{H C} :: \text{B D} : \text{D C}), \\ \text{Sec} : \text{Rad} &:: \text{Rad} : \text{Cos} \quad (\text{G C} : \text{C H} :: \text{B C} : \text{C D}), \\ \text{Cot} : \text{Rad} &:: \text{Cos} : \text{Sin} \quad (\text{I F} : \text{F C} :: \text{C D} : \text{D B}), \\ \text{Cosec} : \text{Rad} &:: \text{Rad} : \text{Sin} \quad (\text{I C} : \text{C F} :: \text{C B} : \text{B D}).\end{aligned}$$

Combining the first and third series we also get

$$\text{Cot} : \text{Rad} :: \text{Rad} : \text{Tan}.$$

It may be remarked, as to the third and fourth series, that they rest on the similarity of the triangles C F I, C D B, a similarity which is at once apparent when we consider that the angles C F I, C D B are both of them right angles, and therefore (as the three angles of every triangle are equal to two right angles) the remaining pair of angles in the one triangle must be equal to the remaining pair in the other. But of these pairs, F C I = C B D, since they are alternate angles formed by the line C B lying athwart the parallels C F and D B; therefore the remaining angle F I C is equal to the remaining angle B C D, and the two triangles are precisely similar.



a circle, cutting both legs of the angle, and let the points of section be named B and H. The length of the radius is of no moment, as the relations hold good whatever the actual length of C B and C H may be. The circle thus described

By considering the radius as unity, we are enabled to state very briefly all the eight trigonometrical ratios given above, as thus—

$$\begin{aligned}\sin^2 + \cos^2 &= 1, \\ \tan^2 + 1 &= \sec^2, \\ \cot^2 + 1 &= \operatorname{cosec}^2,\end{aligned}$$

$$\begin{aligned}\tan &= \frac{\sin}{\cos}, & \sec &= \frac{1}{\cos}, \\ \cot &= \frac{\cos}{\sin}, & \operatorname{cosec} &= \frac{1}{\sin}, \\ \cot &= \frac{1}{\tan}.\end{aligned}$$

So that we can define any function in terms of other functions. This at once gives us the algebraical formulæ, for since  $\text{rad} = 1$ , we may describe the sine of the angle

BCII as well by the ratio  $\frac{BC}{BD}$  as by the line BD, the

cosine as well by the ratio  $\frac{CD}{CB}$  as by the line CD, the

tangent as well by the ratio  $\frac{GH}{CH}$  (or, which is the same

ratio,  $\frac{BD}{CD}$ ) as by the line GH—and so on with the rest.

This brings all the functions to ratios stated in terms of the sides of a right-angled triangle, as was expressed in the first part of this article.

In right-angled triangles, therefore, if we know the dimensions of at least one side and any other two elements out of the six made by the three sides and three angles, we can determine the other three—that is, the shape and size of the entire figure. That is, three sides are sufficient without any angle, but not three angles without any side. And we can do this in any triangle whatever by the help of three equations, of which the first is apparent, and the others only need a very simple demonstration. Taking the triangle ABC, which is any triangle other than a right-angled one, these three equations are—

$$(1) \dots \dots \frac{\text{side } AB}{\text{side } AC} = \frac{\sin C}{\sin B}$$

that is, the sides of a triangle are proportional to the sines of the angles opposite to them, each to each.

$$(2) \dots \cos B = \frac{AB^2 + AC^2 - BC^2}{2 \cdot AB \cdot AC}$$

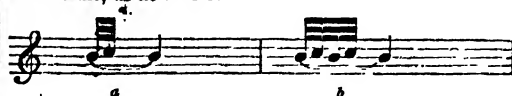
$$(3) \dots \frac{AB + AC}{AB - AC} = \frac{\tan \frac{1}{2}(B + C)}{\tan \frac{1}{2}(B - C)}$$

All angles are measured by degrees of a circle, the whole circumference being divided into  $360^\circ$ , and in every set of logarithmic tables the logarithmic values of all the functions are given for angles of all degrees, and even to quarters of degrees, so that it is quite easy to compute the size or shape of any triangle by the help of the tables and the data above given, if only the necessary three elements are forthcoming, one of them at least being a side.

**TRIGONON**, an ancient instrument of the harp kind, deriving its name from its triangular shape (Gr. *trigonon*, a triangle). The soundboard and tuning bar were fixed at an angle, and there was no pillar, the strings themselves forming the third side of the triangle. Trignons are found on the most ancient Egyptian and Assyrian sculptures and bas-reliefs. More elaborate instruments of the same kind were used by the ancient Greeks, whose trignons are of the right-angled Assyrian type, and not of the more acute-angled Egyptian type, a most important indication for the

history of music. The most perfect representation of a Greek trigonon is on the splendid vase of the nine muses, which is of the time of Alexander the Great, and is now in the Munich Museum.

**TRILL**, in music, is the term used to describe a quick brief shake, as at *a* or *b*.



*Trillo* is the general Italian term for "shake," and the sign *tr* or *hr*, used to denote that grace, is a corruption of the *tr* signifying *trillo*. "Shake," however, is the English term for the more complete grace, and "trill" is relegated to the partial form.

"Trill" is also used to describe the very similar effect sometimes heard in a bird's song. Both lark and nightingale have a specially beautiful trill among their notes, the shake being so close that it is often mistaken for a tremolando. Closer attention will reveal its true character even to an ear not highly skilled in music. In nearly all the finer songs of birds trills are to be detected.

**TRIL'OBITES** (Trilobita) is an order of fossil CRUSTACEA, entirely confined to the Palæozoic rocks. The systematic position of the trilobites is involved in some uncertainty. They are usually regarded as most nearly allied to the Phyllopoda, through such forms as *Apus*. Others regard them as having closer affinities with the Isopoda, with which they agree in having possessed the power in some cases of rolling themselves up into a ball. Others again think they should be ranked near the fossil Eurypterida and the recent king crabs (*Limulus*); in this case, in the light of Professor Ray Lankester's demonstration of the relationship between the king crab and the scorpion, they must be removed altogether from the order Crustacea, and classed with the Arachnida.

The trilobites were marine animals, often of large size. They had the whole dorsal surface of the body protected by a well-developed chitinous shell, which is more or less distinctly divided into three longitudinal lobes, whence the name Trilobita. The ventral surface was unprotected, since many genera had the power of rolling themselves up into a ball like an *Oniscus*. The dorsal shell exhibits three well-marked regions—a cephalic shield, a thorax with a number of movable segments, and a caudal shield, pygidium, or tail, which may be prolonged into a spine. The cephalic shield is more or less semicircular in shape, and bears compound sessile eyes. No traces of appendages have been found on the ventral surface corresponding to this cephalic shield, except a broad plate in front of the mouth, forming an upper lip or labrum; but there can be little doubt but that appendages serving as jaws were present. The thorax consists of a variable number of segments, from two to twenty-six. It has been supposed that the thorax bore delicate membranous limbs to which the gills were attached, and this was probably their structure in most cases; in one large species, however, *Asaphus platycephalus*, some structures have been found which are regarded by some palæontologists as eight pairs of chitinous jointed appendages, serving as ambulatory limbs. The caudal shield is formed of a number of coalesced segments.

The trilobites range from the upper Cambrian rocks to the lower Carboniferous, attaining their maximum in the Silurian rocks. A large number of species have been described, classed in thirteen families.

**TRILOGY** (Gr. *trilogia*), a term applied by the Greeks to a series of three dramas, which, while perfect each in itself, are nevertheless connected by a unity of interest, and form three independent tableaux of a complete historical or poetical picture. In the Greek theatre the "Agamemnon," the "Choëphorai," and the "Eumenides"

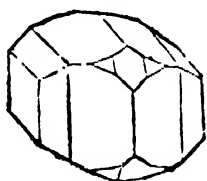
of *Æschylus* (the *Orestia*), and in the English theatre the three parts of "Henry VI." of *Shakespeare*, are examples of a trilogy. Frequently a satyric drama was added as a termination to the three plays, and the whole, in that case, was termed a *tetralogy*. There is no extant example of an ancient Greek tetralogy, and but one (that mentioned above) of a trilogy. A large number of trilogies, however, were written, for the great tragic poets contended for the national prizes with trilogies and not with single plays; but the ravages of time have deprived us of some of their members. We have but one specimen of satyric drama, the "Kyklops" (Cyclops) of *Euripides*. The two dramas of *Sophokles*, "Ædipus the king" and "Ædipus at Kolonos," are portions of a very famous trilogy.

**TRIM**, a town of Ireland, in the county town of Meath, 25 miles north-west from Dublin, is situated on the banks of the Boyne, over which there is an old bridge. It is a very ancient place. The remains of a castle, built in 1220, occupy an area of 4 acres, and consist of the keep and various other towers and outworks. There are also some remains of an abbey, and a tower of great antiquity is connected with the parish church. The county court-house is a modern structure, and there is a county prison, a spacious building. Trim is not a place of much thoroughfare, and has little trade. It is a disfranchised parliamentary borough, and is now governed by twelve town commissioners. Besides the parish church there is a Roman Catholic chapel, schools, infantry barracks, union workhouse, bank, &c., and a pillar to the Duke of Wellington. Trim was taken by Cromwell in 1649. Several Irish parliaments were held here. The population in 1881 was 1586.

**TRIMERA** is a section of the order *Coleoptera* (*BEETLES*), distinguished by having only three joints. The insects popularly known as lady-birds and pull-ball beetles are characteristic of the families composing it, which are all remarkable for brilliant colouring, being generally red or yellow, with black, red, white, or yellow spots. This section contains only two families, *Coccinellidae* (*LADYBIRDS*), forming the group *Aphidiphagi*, and *Endomychidae*, forming the group *Longhorn*.

**TRIMETHYLAMINE**. See *TRIMETHYLAMINE*.

**TRIMETRIC CRYSTALS**, also called *Rhombic Crystals*, are those which have three symmetry planes, referred to three axes at right angles to each other, the three parameters being unequal. Topaz and sulphur are two typical examples. Annexed is a figure of a crystal of citric acid, another member of the trimetric system.



Crystal of Citric Acid.

**TRIMMER**, a political nickname applied in the reigns of Charles II. and William III. to those politicians who

espoused neither the extreme opinions of the Whigs nor the Tories, but occupied a midway or moderate position. Of these the most distinguished was that liberal patron of letters and accomplished writer, Charles Montague, earl of Halifax.

**TRIMORPHISM** (*Gr. treis, three; morphē, shape*), in mineralogy, the term applied to the somewhat rare phenomenon of a chemical compound occurring naturally in three distinct crystalline forms. Silica ( $\text{SiO}_2$ ) is a well-known example of such a trimorphous substance, though two of the three forms in which it crystallizes are very uncommon. As *QUARTZ* the crystals are referred to the hexagonal system, as *TRIDYMITE* and as *ASBESTOS*, to the rhombic system. Another example of an analogous mineral is the oxide of titanium ( $\text{TiO}_2$ ), which occurs as *RUTILE* and *ANATASE*, crystallizing in the quadratic system, and as *Brookite* in the rhombic. See also *DIMORPHISM*.

**TRINCOMALEE**, a fortified town and magnificent harbour on the east coast of the island of Ceylon, is situated in the north-east corner of a great inlet called Trincomalee Bay. The harbour, for accommodation and safety, is perhaps not surpassed by any in the world. It has room enough for whole fleets; is landlocked by high ridges, and sheltered from all winds; has depth of water for the largest ships, even close to the shore; and, what is of most importance, can be entered at all seasons during both monsoons. A ship from Madras can reach it in two days. The town is at the base of a rock, crowned by Fort Frederick, and contains barracks for European troops, but the station is unhealthy.

The inhabitants, who are not numerous, are chiefly Hindus from Tanjore and the adjacent coast of Hindustan, with a few natives of Ceylon and the British troops stationed there. The climate is hot; the mean temperature of the coolest months, when the north-east monsoon prevails (April to October), is about  $77^\circ$  Fahr.; the mean of the hottest, when the land-wind, or south-west monsoon, blows, is about  $83^\circ$ . There is little export trade, the produce being hardly enough for the wants of the inhabitants, though the adjacent country was once populous, and exported grain and other provisions to the coast of Hindustan. Many reservoirs and other works for irrigation and drainage are now in ruins and choked up; and swamps, jungles, and woods, abounding with wild hogs, buffaloes, and elephants, fill the atmosphere with malaria, and render the climate more unwholesome than the greater part of the rest of the island.

The fortifications extend for a mile along the shore. The defences were mostly constructed by the Portuguese, who held the town from 1620 to 1658, when it was taken by the Dutch. In 1782 it came into the possession of the English, but was taken by the French, and restored to the Dutch in the following year, and they retained it until the capture of Ceylon by the British in 1795, when it was surrendered after a siege of three weeks. From its great advantages as a port it has been suggested, and Sir J. E. Tennant supported the opinion, that Trincomalee should be made the capital of the island of Ceylon, and the residence of the governor. If this were ever done it might be fairly expected that the surrounding country would soon resume its ancient fertility.

**TRINCOMALEE WOOD**. See *BERBERA*.

**TRINIDAD**, an island in the West Indies, belonging to England, is the most southerly of the West India Islands, and is separated from South America by the Gulf of Paria, which forms an immense harbour with good anchorage. Trinidad is about 65 miles long and 50 broad, and contains 1754 square miles. The western coast is low, and either sandy or swampy, but the three other sides are rocky and elevated. A chain of mountains, which occupies a breadth of about 10 miles, and whose highest points vary from 1800 to 3000 feet, runs along the northern side, close to the sea. Southward of them is a plain, then occurs a range of hills, then another plain, and lastly, another chain of hills near the south coast. The whole island is well watered by streams in every direction. The mountains on the north are clothed with stately forests, and their margins fringed with overhanging mangroves, dipping into the sea. Trinidad is not visited by hurricanes. The climate is apparently less unhealthy than that of many of the other West India Islands, and the island is not subject to droughts. The beneficial and abundant dews, arising from the numerous rivers of the island and the surrounding ocean, cool the atmosphere, and give an unusual luxuriance to the vegetation. The average annual rainfall is about 75 inches. There are several active mud volcanoes, which throw mud to a height of 30 feet, and occasionally emit flames. The most remarkable natural feature is the Pitch Lake, about a mile and a half in circumference. The pitch at the sides

is perfectly hard and cold, but as one walks towards the middle with the shoes off, in order to wade through the water, the heat gradually increases, the pitch becomes softer and softer, and the impression of the feet is left upon its surface. At last it is seen boiling up in a liquid state, and the air is there strongly impregnated with bitumen and sulphur. During the rainy season it is possible to walk over nearly the whole lake. The pitch and asphalt of this district are now of considerable commercial value.

Trinidad possesses some excellent harbours, such as Chaguaramas, Guaya-guayara, and Puerta d'España. On the last-named stands the town called the Port of Spain, the capital of the island. All the usual productions of tropical countries grow luxuriantly: the most important being cocoa, coffee, tobacco, arrow-root, cocoa-nuts, sugar, nutmeg, and cinnamon. Rum is manufactured in considerable quantities. The exports of all kinds are valued at about £2,800,000, and the imports at about £2,700,000 per annum. The chief trade is with Great Britain, the United States, and the neighbouring islands. The imports from this country consist chiefly of cotton and iron manufactures, flour, rice, casks, staves, and hoops. The revenue and expenditure of the colony each amount to nearly £160,000 a year. There is a public debt of about £600,000, chiefly contracted for railways, of which there are about 52 miles.

The slaves in the island in 1834 numbered 20,657, and their owners received the sum of £1,033,392, or rather more than £50 a head as compensation when slavery was abolished. The number of free blacks and whites at the same time was 18,724—making the total population 39,381; in 1881 it had increased to 153,128.

Trinidad is under the administration of a governor and council, acting under the orders of the secretary of state for the colonies. The laws are a mixture of those of England and Spain.

Trinidad was discovered by Columbus in 1498, when it contained a numerous aboriginal population. It was first colonized in 1588 by the Spaniards; in 1676 it was captured by the French, but almost immediately restored, and in 1797 it was taken by the British under Abercromby, and has since remained in their possession.

**TRINITY** (Gr. *trias*, Lat. *trinitas*), a term of Christian theology, used to describe the Divine Being as consisting of three persons united in one God. The most concise statement of the doctrine of the Trinity is that contained in the so-called Athanasian Creed—"We worship one God in Trinity, and Trinity in Unity; neither confounding the persons nor dividing the substance. For there is one person of the Father, another of the Son, and another of the Holy Ghost. But the Godhead of the Father, of the Son, and of the Holy Ghost is all one; the glory equal, the majesty co-eternal." The doctrine of the Trinity, historically considered, dates from the latter half of the second century, Theophilus, bishop of Antioch, who flourished during that period, being the first to use the term *trias*, its equivalent, *trinitas*, being first employed by Tertullian in the third century; but disputes concerning the nature of Christ and his relation to the Father had agitated the churches from the first preaching of Christianity, as we may see from the Epistles. The word Trinity is not used either in the Old or New Testaments, and it is universally admitted that no passage can be adduced from the Old Testament in which the doctrine of the Trinity or its equivalent is distinctively or explicitly formulated. In reference to the divine nature the great doctrine of the later portions of the Old Testament is that of the unity of God, as opposed to polytheism; but at the same time there are many references to God which appear to indicate the existence of some form of plurality in the Godhead, and these have been claimed by Christian writers from a very early period as foreshadowings of the clearer and more distinct revelation

believed to have been made in the New Testament. These texts, however, are capable of various interpretations, and the Jews, while they revere the Old Testament scriptures as being inspired writings, have never accepted any Trinitarian explanation, but have on the contrary formulated and enforced with the utmost care their doctrine of the simple and absolute unity of God as one person. It is therefore to the New Testament that we must turn for the foundation of the doctrine, and here we find a very large number of passages which are claimed by Trinitarians as establishing the doctrine of the Trinity. It is admitted that the revelation of the doctrine was a gradual one, and that the disciples, during the ministry of Christ and the first years of the Christian Church, did not understand it; but it is maintained that although the doctrine is not distinctly formulated in the New Testament, a careful examination of its teachings will show that it had become part of the system of Christianity before the close of the apostolic period. The texts bearing upon the subject may be divided into two classes—those in which the Father, Son, and Holy Spirit are mentioned in connection, and those in which these three persons are mentioned separately, and in which their nature and mutual relation are more particularly described. Among the more noteworthy texts of the former class are the baptismal formula given Matt. xxviii. 19, and the apostolic benediction of 2 Cor. xiii. 14; the passage relating to the Trinity in the Authorized Version, 1 John v. 7, is now universally regarded as spurious, and was omitted by the revisers of 1881. Passages of the second class are very numerous, and defenders of the doctrine claim that they assert the eternal existence of Christ, ascribe to him the divine attributes of omnipotence, omniscience, and omnipresence, assert his divine nature, ascribe to him works which must of necessity belong to God, apply to him titles such as are due to God alone, refer to worship paid to him, and lastly, expressly, as in John i. 1, &c., apply to him the title of God. The argument for the personality and divinity of the Holy Spirit is of a similar character, and is also supported by numerous passages, found chiefly in the Acts and the Epistles.

As we have said, however, the doctrine of the Trinity was only developed gradually, and it does not appear to have been *systematized* in any way during the apostolic period, and during the ante-Nicene period there was uninterrupted controversy about it, or rather about the nature of Christ, principally in the Eastern churches, among whom several systems of doctrine were formulated which the majority branded as heretical. Among these were the doctrines of the Docetæ or Seemers, who held that Christ was one of the Æons who had put on the shape of a man, but who had suffered in appearance only; those of the Ebionites, who regarded Jesus as man only; those of the Patri-passians, who regarded Jesus as a manifestation of the Father, and who were therefore accused of teaching that the Father had suffered; of the Sabellians, according to whom the Father, the Son, and the Holy Ghost were only the different forms in which the one God reveals himself to man; of the Arians, who taught that the Son was not co-eternal with the Father, but created by him before the world, and therefore subordinate and inferior to the Father; and of the Macedonians, who denied the personality of the Holy Ghost. In the fourth century the strife concerning this doctrine grew so bitter that it threatened to rend the church to pieces, and the Emperor Constantine found it necessary to interfere. He accordingly summoned the Nicene Council in 325 A.D., which, after much disputation, drew up a formula to exclude the Arians, which forms the nucleus of the famous Nicene Creed. The creed as settled at the Council of Nicea only mentioned the Holy Spirit in general terms, and as many in the church interpreted it in a ditheistic manner, a council, held at Constantinople in 381 A.D., added certain clauses to the

creed, and declared that the Son and Spirit are coequal with the Father in the divine unity, the Son eternally begotten by the Father, and the Spirit proceeding from the Father. The shade of subordination of both the Son and the Spirit implied in the saying that the Spirit proceeded from the Father, was removed by the Council of Toledo (589 A.D.), which declared that the Holy Ghost proceeded also from the Son (*filioque*), and this addition was finally adopted throughout the Latin Church. The Eastern Churches, at first acquiescent and silent, afterwards protested against this change as an innovation, and the phrase *filioque* still remains one of the chief hindrances of a reunion between the Greek and Roman Catholic Churches. The doctrine owes its completion to the unknown author or authors of the ATHANASIAN CREED, who left no opening for the return of the heresies of earlier times, and who made the acceptance of the doctrine as formulated one of the conditions of salvation. The doctrine of the Trinity thus asserted, remained the faith of the church up to the period of the Reformation, and after that crisis the Reformed and Lutheran Churches retained the doctrine unchanged. In the unsettlement of opinion, however, which then ensued, the doctrine of the Trinity, among others, came under consideration, and ever since the sixteenth century it has been attacked as contrary to Scripture and sound reason by a large number of theologians, and by several new denominations, as the Socinians, the German theosophists (Wiegand, Boehm, &c.), the Unitarians, and the Universalists. Swedenborg referred the Trinity to the person of Christ, teaching a Trinity, not of persons, but of the person, by which he maintains that that which is divine in the nature of Christ is the Father, that the divine which is united to the human is the Son, and the divine which proceeds from him is the Holy Spirit. The spread of Rationalism in the Lutheran and Reformed Churches undermined for some time the belief in the Trinity among a large number of German theologians. Kant held that Father, Son, and Spirit designate only three fundamental qualities in the Deity—power, wisdom, and love; or three agencies of God—creation, preservation, and government. Hegel and Schelling attempted to give to the doctrine of the Trinity a speculative basis, and after their example the modern dogmatic theology of Germany has in general undertaken a defence of the doctrine of the Trinity on speculative as well as theological grounds. At the present day the doctrine of the Trinity is held by the Roman Catholic Church, and by most of the Protestant and Eastern Churches; but it is a matter of common observation, deplored by some and welcomed by others, that the doctrine is being quietly superseded by Unitarianism among many of the free or non-established Protestant Churches of England and America, as well as among the Broad Church party in the Established Church. For an account of the Unitarian doctrine see under UNITARIANISM.

In conclusion it may be noted that while the orthodox Christian doctrine of the Trinity has features peculiar to itself, doctrines resembling it in many particulars are to be found in several mythologies and systems of philosophy. Thus the ancient Egyptians, who laid great stress upon the mystical number three, seem to have divided their God Horus into three parts or persons; the Hindus, in their earlier mythology, had three deities—Agni, Indra, and Sûrya—which appear in some of the Vedas to be regarded as forms of one God; while a later system has the Trinity of Brahma, Vishnu, and Siva. Plato, in his theological speculations, also speaks of the divine nature as existing in the three manifestations of first cause or *Agathon*, the reason or *Logos*, and the soul or spirit of the universe. The *Logos* of the Platonists afterwards became a separate being among the Jews of Alexandria, and at a later period it was identified by Christian teachers with Christ.

Exhaustive works on the history of the doctrine of the

Trinity have been published by Baur, "Die christliche Lehre von der Dreieinigkeit" (Tubingen, three vols. 1841–43); and Meier, "Die Lehre von der Trinität in historischer Entwicklung" (Hamburg, 1844). See also Hodge's "Systematic Theology" (Edinburgh, 1878).

**TRINITY COLLEGE, CAMBRIDGE.** Two colleges formerly existed upon the site of Trinity College: the one named Michael House, dedicated to Michael the Archangel, was founded in 1324 by Harvey de Stanton, chancellor of the exchequer to King Edward II.; the other was King's Hall, founded in 1337 by Edward III. Both were resigned into the king's hands in 1546 by the respective masters, and their lands in the same year made part of the endowment of a new college founded by Henry VIII., under the name of Trinity College.

The scholarships at Trinity College are divided into major scholarships (of which there are at least seventy-four) and minor scholarships, of which about six are annually offered. Ordinary major scholarships are tenable for five and a half years from beginning of residence, and are worth £100 a year to a resident undergraduate, and £80 to a resident B.A.

At the scholarship examinations, exhibitions of about £10 are awarded on the same conditions as the minor scholarships, one at least (value £50) being for natural science. There are also about six special exhibitions for candidates from certain specified schools, worth about £10. There are sixteen sizars upon the foundation, who are entitled to commons and allowances of the value of more than £90 per annum each, the value of a sub-sizarship being about £50.

The ordinary fellows (i.e. about fifty-four out of the sixty) are chosen from among graduate members of the college, or occasionally of other colleges, whose standing from their bachelor's degree does not exceed three years. A fellow so elected usually vacates his fellowship after six years from election, or one year after presentation to a college living worth over £400; but if he holds one of the university professorships or readerships, or one of the university offices of public orator, registrar, or librarian, or one of the college offices of prælector, dean, bursar, tutor, assistant tutor, or lecturer (but not assistant lecturer), he retains his fellowship during tenure of such office, and after holding one or more of these college offices for fifteen years, he may keep his fellowship for life. The regius professors of Hebrew and divinity (whether fellows or not) are entitled to rooms (unless married) and commons in the college, free of charge; and the regius professor of Greek, unless a master or fellow of another college, must be elected a fellow of Trinity. In addition to the fellowship attached to the professorship of Greek, five other fellowships are reserved for professors of the university. The council may elect to a vacant fellowship any person (although of more than three years' standing from his first degree) who holds the office of bursar, prælector, or lecturer, or whom they propose to appoint at once to the office of dean; or any professor or reader of the university; or any person eminent for science or learning, not being a master or fellow of another college. Each fellow (not being an honorary or supernumerary fellow) receives, besides rooms and commons, a dividend not exceeding £250, or a larger amount if he has held certain college offices, according to the length of tenure of such offices.

Trinity College is situated between St. John's College and Caius College, occupying the space between Trumpington Street and the river Cam. It consists of three courts of unequal dimensions. The outer and larger one is entered from Trumpington Street by a turreted gateway, said to have been formerly the entrance to King's Hall; and the inner one is called Neville's Court, from Thomas Neville, master of the college and dean of Canterbury, by whose benefaction the principal part of it was built.

## TRINITY COLLEGE.

The library, which now forms the west side, is of later date, was designed by Sir Christopher Wren, and was magnificently re-decorated in 1872. A third court, adjoining Neville's, was completed in 1825, and another was built by the late eminent master, William Whewell, who also bequeathed his large fortune for the purpose of building a fifth (which was completed in 1869), and founding a professorship of international law. The chapel was begun by Queen Mary, and finished by Elizabeth; it was restored and decorated in 1871-76. In the ante-chapel are fine statues of Sir Isaac Newton, by Roubiliac, and of Macaulay and Dr. Whewell, by Woolner. The hall, which is about 100 feet in length, is in the mixed style of architecture. The Master's Lodge has always, since the time of Queen Elizabeth, been the residence of the king when the university has been honoured with a royal visit; and the judges always lodge there during the assizes.

**TRINITY COLLEGE, OXFORD.** This college was originally founded and endowed by Edward III., Richard II., and the priors and bishops of Durham. As it was under the patronage of the latter, it obtained the name of Durham College, though dedicated from the beginning to the Holy Trinity, St. Mary, and St. Cuthbert. At the Reformation it was suppressed. Sir Thomas Pope, Knight of Tittenhanger, in Hertfordshire, 20th February, 1554-55, purchased the site and buildings, and founded the present college, dedicated to the "holy and undivided Trinity;" for a president, twelve fellows, and twelve scholars.

The founder directed that the scholars should be chosen from his manors; but if no such candidates properly qualified appear on the day of election (Trinity Monday), that then they shall be supplied from any county in England. Under the new statutes the fellowships and scholarships are entirely open. The value of the latter is £80 a year. There are twelve fellowships.

The original buildings of this college were those which belonged to Durham College, and were repaired by Sir Thomas Pope for the use of his society. During the great rebellion they became ruinous; and in 1661 Dr. Bathurst, then president, began to repair the quadrangle, which he completed in 1687, at his own expense. Soon after a new court of three sides was projected in the Fellows' Garden, and was completed in 1728. Sir Christopher Wren was the architect employed on it. The hall, on the west side of the quadrangle, having fallen into decay, was rebuilt in 1618. The library, though it has undergone various changes, is in substance the oldest part of the college, having been erected in 1370. The present chapel, originally that of Durham College, was erected between 1691 and 1694.

**TRINITY HALL, CAMBRIDGE,** was founded in 1350, by William Bateman, bishop of Norwich. The college continued to be governed by the statutes of the founder until the year 1860, when new ones were enacted. Scholarships are tenable up to the time of taking the B.A. or LL.B. degree; they are at present sixteen in number, and vary in amount from £21 to £70. The scholarships are awarded according to the results of the various college examinations in classics, mathematics, law, and history. The scholarships of the largest amount are usually given to students who have just concluded their first year. Scholarships obtained at one examination may be augmented on a subsequent occasion. There are three or more law studentships tenable for three years, and of the annual value of £50, given to graduates of the college in arts or law who intend to prepare themselves for practice in some branch of the legal profession. The holders of these studentships are not required to reside in the university.

The college, which is situated near the river Cam, between Clare Hall and Gerrard-Hotel Lane, consists of a small neat court faced with stone. The old hall was demolished in 1742.

## TRINITY HOUSE.

**TRINITY HOUSE,** officially called "The Corporation of the Elder Brethren of the Holy and Undivided Trinity," is a society which has the management of some of the most important interests of the seamen and shipping of England. The earlier records, together with the house of the corporation, were destroyed by fire in 1714. A society having been formed under the above name at Deptford, in 1518, by Sir Thomas Spert, Knight, it received a charter of incorporation from Henry VIII., which is the earliest official document relating to the Trinity House now extant. The privileges of the corporation were confirmed in 1658, and in 1680 its first lighthouse was erected—all the lighthouses which had previously existed on the English coast having been built by private individuals under patents from the crown. By 6 & 7 Will. IV. c. 79, and the Merchant Shipping Acts, 1854 and 1874, private rights in light dues were abolished, and the exclusive right of lighting and buoying the coast vested in the Board of Trinity House. The same Acts gave them a general supervision over the Commissioners of Northern Lights; the Ballast Board of Dublin; and the corporations which have charge of the lighthouses and buoys of Scotland respectively, subject to an appeal to the Board of Trade, to whose general superintendence Trinity House is also subject in matters relating to England. The lighthouses of the Isle of Man are under the charge of the Commissioners of Northern Lights. The power to license pilots for the English coast is vested exclusively in the Corporation of the Trinity House.

The corporation consists of an indefinite number of members, of whom thirty-one are styled elder, and the remainder younger brethren. The master, who is generally a member of the royal family or a statesman of high rank, has associated with him ten noblemen or gentlemen who have (as a rule) been eminent in the great public departments of the state; the conduct of its active duties rests with twenty of the elder brethren, under the presidency of the deputy master, and these members complete the thirty-one elder brethren. The twenty acting brethren are officers of the mercantile marine and of her Majesty's navy, the latter being a small proportion of the whole number. The deputy master and the acting elder brethren are really self-elected from a list of the properly qualified younger brethren; and the qualifications for this purpose are—that the candidate shall have attained the rank of commander in her Majesty's navy for at least four years previously, or shall have served as master in the merchant service, on foreign voyages, for that period. The younger brethren are chosen from members of the royal navy, or from the commercial marine, and are admitted at the pleasure of the court of elder brethren, upon a proposition to that effect being made by any one of these elder brethren.

The annual revenue of the corporation is very considerable, and is partly derived from tolls paid in respect of shipping which receives benefits from the lights, beacons, and buoys, and from the ballast supplied. The ballast is raised from such parts of the bed of the river as it is expedient to deepen, by machinery attached to vessels. The remainder of the revenue arises from lands, stock, &c., held by the corporation, partly by purchase, partly from legacies, &c., and donations of individuals. The whole is employed upon the necessary expenses of the corporation in constructing and maintaining their lighthouses and lights [see LIGHTHOUSES], beacons and buoys, and the buildings and vessels belonging to them [see BUOYS]; in paying the necessary officers of their several establishments, and in providing relief for decayed seamen and ballast-men, their widows, &c. The present house of the corporation is on Tower Hill. Neither the honorary members nor the younger brethren derive any pecuniary advantage from their connection with the corporation, but those brethren



who do the actual work are paid salaries averaging about £350 a year each. The various duties of the corporation are parcelled out among the wardens and different committees appointed for the purpose of discharging the same. The deputy master and elder brethren are employed on voyages of inspection of their lighthouses and lights, beacons and buoys, not unfrequently in most trying weather and seasons; and they are also often engaged in making surveys, &c., on the coast, and reports on such matters of a maritime character as are referred to them by the government.

The Trinity House has at present on the coasts of England and Wales about eighty lighthouses, forty light-vessels, and about 500 buoys and beacons; and employs on an average 900 persons in their management. There are also in Scotland sixty lighthouses, 120 buoys, and forty beacons; and in Ireland seventy lighthouses, five light-vessels, and eighty buoys and sixty beacons.

**TRINITY SUNDAY**, the Sunday immediately following Whit or Pentecost Sunday, and so called because appropriated to special services in honour of the Blessed Trinity. The feast was not known to the early fathers of the Christian Church, and though probably observed in some of the churches of the West as early as the ninth century, was not recognized throughout Christendom until established by a decree of Pope John XXIII. in 1334.

**TRINOBAN TES**, a tribe of the ancient Britons inhabiting the counties we now call Essex and South Suffolk. The explanation becomes necessary because of the laureate's magnificent poem "Boadicea," wherein the injured Queen of the Iceni (who peopled Norfolk, Cambridge, and North Suffolk) calls on her neighbours to avenge her wrongs:

"Hear Icerian, Caticuchlanian! hear Coritanian, Trinobant!"

The Caticuchlanians spread from the Thames to the heart of England, and the Coritanians, who held Lincolnshire, reached inland to meet them.

**TRINO MIAL**, the algebraical name for an expression which consists of three terms, as  $a^3$ ,  $b^3$ ,  $c^3$ , or  $ax^3 - bx^3 + cx^3$ .

**TRIO**, in music, is a piece of music for three voices or instruments. A trio for strings, or for pianoforte, violin, and violoncello is usually the same as to form as a string quartet; that is to say, it is a symphony on a small scale. Charming works of this description abound by the great masters of chamber-music. Haydn, Beethoven, and Mendelssohn are perhaps the most successful in this form.

Trio is also the name given to the second movement in minuet-form. It is, in fact, a second minuet, the order of performance being:—minuet (both parts repeated), trio (both parts repeated) minuet *da capo*, once through. The origin of the term is said to be from the fact that while the minuet proper was played by the whole orchestra, the trio was played by three solo instruments; but there is no authority for this plausible suggestion, and certainly it is not the practice to perform the trio in that manner in any known work of excellence. Schumann has examples of two trios in a minuet, and Beethoven also gives occasionally a similar type, though in a less formal way.

**TRI OLET**, in poetry, a stanza of eight lines, in which the first line is thrice repeated. In music, the term is practically identical with triplet.

**TRIONYCIDÆ**, a family of Tortoises (*Chelonia*), to which the names Mud River and Soft Tortoises are often given. They are inhabitants of rivers, deep lakes, and even arms of the sea, in the warmer parts of the world. In accordance with this aquatic life their feet are webbed down to the nails with broad flexible membranes; there are five toes on each foot but three only are provided with nail. The neck is generally very long, and retractile within the shell. The head is narrow in front and pointed, the bones composing it being nearly eukled. The jaws are horny,

and covered with a dependent fleshy fold of skin resembling lips. The nostrils are prolonged into a thin cylindrical tube, like a small movable proboscis. Their carapace is very broad, and nearly flat. It is soft, destitute of plates, and covered with a flexible and cartilaginous skin, which extends all round the edges of the shell. These edges are soft and destitute of bones, and the ribs are only united together and to the vertebrae above, while they are separate below. The plastron or breastplate is formed of a ring of bones, the centre not being ossified, and covered with a continuous skin. In adult individuals these bones are furnished with rough callosities on the prominent parts. The legs are short, strong, flattened, and more or less like fins; they are covered with a naked skin.

The River Tortoises are, in a great measure, nocturnal animals. At night, when they consider themselves free from danger, they come forth from the water to stretch themselves out on the rocks in the little islets, or take up a position on the trunks of trees overturned in the rivers, but from which they precipitate themselves again into the



Carapace of Trionyx.

water at the least noise or appearance of danger. They are very voracious, and very nimble in pursuit of their prey. This consists of fishes, reptiles, and molluscs, to which they are continually giving chase, and which they pursue while swimming. They in their turn are eagerly sought after by man, for their flesh is much esteemed as an article of food. In order to catch them it is necessary to angle for them, and to bait the hook with live fishes or other small animals, to which motion must be given, for they will not touch carrion or motionless prey. When they seize their prey, or when they are called to defend themselves, they dart their head and long neck forward with the rapidity of an arrow. They bite severely, nor will they let go their hold without taking out the piece seized. Their bite in consequence is much dreaded by the fishermen, who generally cut off their heads as soon as they are caught. The males appear to be less numerous than the females, or at least they are less frequently seen near the shore, the females being obliged to come to land to lay their eggs. These they deposit in large holes, which they dig out in the sand, of sufficient size to hold fifty or sixty. They are white and spherical, with a shell which is membranous or very slightly calcareous.

The Soft-shelled Tortoise (*Trionyx ferox*) is a native of North America, inhabiting rivers flowing into the Gulf of Mexico, the Mississippi and its tributaries, the foot of the Rocky Mountains, and the great lakes. This species is a foot or more in length. A nearly allied species has a



more northern range in the United States. The *Trionyx* of the Ganges (*Trionyx gangeticus*) inhabits that river and its tributaries, and is also found in the Malay Peninsula. It attains a length of nearly 2 feet. The Tyre or Soft Tortoise of the Nile (*Trionyx nilotica*) inhabits the Nile and other rivers of North and West Africa. It sometimes attains a length of 3 feet. This species destroys great numbers of young crocodiles. Other species of Soft Tortoises are found in tropical Asia and Africa.

**TRIPE DE ROCHE** is a name originally bestowed by the Canadian *royauteurs*, or backwoodsmen, upon several species of *LICHENS* belonging to the genera *Gyrophora* and *Umbilicaria*. This "rock tripe" furnishes but a coarse and unsatisfactory food, and its food properties, such as they are, are sadly deteriorated by the possession of a bitter principle which induces violent attacks of diarrhoea. Nevertheless it has been found of service by many of our arctic explorers. It grows abundantly in the rocky districts of the north, and one species has been found in the Himalayas at an altitude of upwards of 18,000 feet.

**TRIPIT'AKA** (triple basket), the threefold division of the Buddhist scriptures: the *Vinaya* or discipline, the *Abhidharma* or metaphysics, and the *Sutra* or proverbs. These being written on palm leaves were kept in baskets, and a triplet of baskets was therefore the library of a Buddhist friar.

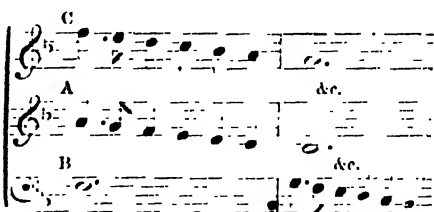
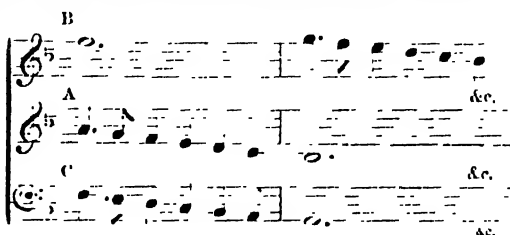
**TRIPLE ALLIANCE** is the name given to two important international treaties. In 1667 Louis XIV., king of France, took advantage of the decline of the Spanish monarchy about that period, and set up a claim to the Spanish Netherlands in right of his wife. He invaded the country with a powerful army and immediately captured Lille, Courtrai, and several other cities. In fact, it became at once evident that no force in the Netherlands was able to stop or retard the progress of the French arms; and under these circumstances Sir William Temple, the British minister at Brussels, urged upon his government the importance of forming a league with Holland in order to save the Netherlands, and they having agreed to the proposal he was commissioned to enter into a union with the minister of that country to check the ambitious designs of Louis. This agreement was afterwards joined by Sweden, and hence it is known by the name of the Triple Alliance of 1668. Louis was obliged to give way, and the plenipotentiaries of all the powers met shortly afterwards at Aix-la-Chapelle, where a treaty was concluded by which Spain resigned to France all the towns conquered by the French in the campaign, but was guaranteed in the possession of the rest of Flanders. The second Triple Alliance was concluded in 1717, between England, France, and Holland against Spain. It recognized the Hanoverian succession in England, and provided for the demolition of the fortifications of Dunkerque. Germany soon afterwards acceded to the new confederacy, and the Triple was merged into the Quadruple Alliance, which greatly crippled the power of Spain.

**TRIPLE COUNTERPOINT**, a counterpoint in three parts so devised that each part will serve for upper, middle, or lower as desired. It is much hampered by rules, because a complete common chord can never be employed; for if it were, the Fifth of the chord, when inverted as a bass, would stand at a Fourth below the root, a position highly disapproved of. A complete composition, indeed, cannot be written in triple counterpoint, because one of the inversions will terminate with the Third instead of the root of a chord in the bass; it is usual therefore to have a free termination to a passage in triple counterpoint, that is, a termination in which the counterpoint is dropped for the time. A very usual way of writing triple counterpoint is by taking a passage of double counterpoint at the octave (counterpoint in two parts, either of which may serve as a bass to the other), and adding Thirds above or Sixths below one of the parts.

Appended is an example from Macfarren's splendid manual of the art.



Triple Counterpoint formed by adding Thirds above C, one of the parts of the Double Counterpoint B and C, to form A.



Commencements of some of the inversions of above.

**TRIPLE FLAGEOLET**, an instrument which was made up of three ordinary flageolets so bound together that they could be blown by one mouthpiece, and were therefore capable of sounding chords of three notes—invented by Bainbridge about 1830. The instrument never took the public fancy, being very difficult to finger, as may be imagined, and quickly died out. A specimen is, however, preserved at the South Kensington Museum.

**TRIPLE HARP**, or *Welsh Harp*, so called because it has three strings to each note, and is the national instrument of Wales. [See HARP.] The two outer strings are in unison and in the diatonic scale, while the inner string gives the semitone. The object of this arrangement is to enable the performer to prolong a sound by rapidly repeating it with thumb and first finger, one to each of the outer strings, in a brilliant tremolando, very difficult but very effective. In no other way can the fugitive thrabbling sound of the harp be sustained.

**TRIPLE TIME**, in music, a time consisting of three measures in a bar, such as  $\frac{3}{4}$ ,  $\frac{3}{8}$ , or the true  $\frac{3}{2}$ . When each beat of triple time is itself triply divided, as in  $\frac{9}{8}$  time, this is called compound triple time. No time divisible by 2 is a triple time; for instance,  $\frac{4}{4}$  and  $\frac{1}{2}$  are compound duple times, and not triple. They are counted by two or four beats in a bar, not by three.

**TRIPLET**, in poetry, a succession of three lines with identical rhymes, as in the following:—

"Who'er she be,  
That not impossible she,  
That shall command my heart and me."

In music, the grouping together of three notes, which are played in the time of one; three quavers being thus made

equal to one crotchet, instead of the ordinary duple division of the note into two quavers. Thus:—



**TRIPPLICATE.** In the common arithmetical sense, the triplicate of a given ratio is found by taking the cube of each of the terms of the ratio. Thus when we say that two similarly-formed solids, whose linear dimensions are as 4 to 7, are in the triplicate ratio of 4 to 7, it is meant that the bulks of those solids are in the ratio of  $4 \times 4 \times 4$  to  $7 \times 7 \times 7$ , or of 64 to 343.

**TRIP'LUM**, the third part above the tenor or melody in mediæval music—the original of our TERNUM.

**TRI'POD** (Gr. *tripous*) is any article of furniture resting upon three feet, whence the name is given to tables, chairs, movable altars, and other articles of the same kind. A chair or an altar of this kind must be understood when we read that the Pythian priestess of Delphi gave her oracles from a tripod. We find also mention of tripods containing a certain measure of fluid (Homer, *Iliad*, xxiii. 264), and in this case we have to understand a bowl resting upon a pedestal with three feet. The krater, or the vessel in which the wine was mixed with water at the banquets of the ancients, was very frequently of this description. It was generally of metal and often of exquisite workmanship. Tripods were the most common presents to the temples of Apollo, whether at Delphi or elsewhere, were given to the victors in the games which were celebrated in honour of Apollo, and appear on innumerable coins which have any relation to the worship of that god. Some ancient specimens are preserved in the British Museum.

**TRIPOLI** is a country in Northern Africa, which extends along the southern shores of the Mediterranean, from  $11^{\circ}$  to  $25^{\circ}$  E. lon. On all other sides it is surrounded by countries which form portions of the Sahara, or Great Desert, or are unfit for cultivation. The width from north to south cannot be definitely stated. The area is estimated at 300,000 square miles, and the population at 1,100,000.

West of the town of Tripoli the coast is low and sandy, and contains no harbour except that of Old Tripoli, which is almost choked up with sand. Tripoli itself has a good harbour. The low and sandy coast continues eastward of the town as far as Cape Sciarra, and contains no harbour. Beyond, the shore is higher, and consists of rocky points and capes, with sandy bays between them, a few of which afford shelter for small vessels. The Gulf of Sidra (anciently the *Greater Syrtis*) occurs about the middle of the coast-line: it is 280 miles wide, and its greatest extent inland is about 120 miles. Bengazi, which is situated at its eastern entrance, has a safe port, which, however, is fast filling up with sand. The coast from Bengazi eastward to the limits of the territory is at first for the most part low and sandy, but further on it becomes high and rocky. It contains the bays of Ptolemeta, Susa Hammam (near which are the ruins of the ancient town of *Apollonia*), Hilal, Derna, and Bombah.

The coast-line of Tripoli exceeds 1000 miles, but contains only two or three harbours in which vessels of moderate size can find tolerable shelter. There is perhaps no other coast-line on the globe of equal extent which is so little favourable for commerce.

**Physical Aspect.**—Two ranges of mountains traverse the western part, from W.N.W. to E.S.E., running nearly parallel to the coast. The northern, called the Gharian Mountains, is visible from the sea, being only 15 to 20 miles inland. The southern range, 30 miles further to the south, is called the Sudah Mountains. Some peaks of the Gharian chain attain an elevation of 4000 feet. Several minor ridges branch off from the eastern por-

tion of this range on its northern side, and approach close to the Mediterranean between Cape Sciarra and the ruins of the town of Lebda. Much corn and fruit are produced among these mountains, but a considerable portion of the tract is used as pasture grounds. A low table-land to the east of the Gharian Mountains, in approaching the Gulf of Sidra, splits into several short ranges of hills, which fill up the space between Cape Sciarra and the town of Mesurata, and in some places come close to the sea; many very fertile spots are met with here. The country south of this table-land, extending to the Sudah Mountains, contains a much smaller portion of cultivated ground than that north of it. Its surface presents a succession of several wide depressions, running from west to east, and terminating on the east in the low grounds which extend along the shores of the Gulf of Sidra. From each of these wide valleys smaller ones branch off, and penetrate a few miles into the higher grounds, which inclose them. The habitable portion of this region is very limited.

Near the western shore of the Gulf of Sidra is a marsh about 100 miles in length, forming the worst portion of the coast. A very sterile country also incloses the bottom of the gulf. The eastern side has a district of a more favourable character, which is called BARCA. It was known to the ancients as *Cyrenaica*, and comprehends the country which, between  $20^{\circ}$  and  $23^{\circ}$  E. lon., projects into the Mediterranean nearly in the form of a semicircle, and the lands lying south of it as far as about  $29^{\circ}$  N. lat. The greater portion of it is mountainous. On the west, a range of mountains is separated from the shores of the Gulf of Sidra by a low plain, which is called the Plain of Bengazi, from the town of that name, which since 1879 has given title to a detached province directly dependent on Constantinople. It extends along the eastern shores of the Gulf of Sidra, from Braiga to Ptolemeta, a distance of about 180 miles in a straight line. Many portions of it are fertile. The mountain region of Barca is table-land, with a surface generally hilly, fertile in its western part, and somewhat sterile in its eastern. Three oases (Angila, Jalloo, and Leshkeneli) contain together about 10,000 inhabitants. There are three smaller oases between Angila and the southern extremity of the Gulf of Sidra.

**Climate.**—There are no rivers, but abundant rains fall from November to March, and are collected in numerous tanks and cisterns, to provide against the succeeding droughts which prevail throughout the remainder of the year, more especially from May to September, during which period sometimes not a single shower falls. At this time the heat is intense, the sirocco often blows, and the thermometer rises to  $90^{\circ}$  and  $92^{\circ}$ . During the rainy season the fluctuations of temperature are often very great, the thermometer frequently falling during the night to  $40^{\circ}$ , or to the freezing point, and rising during the day to above  $70^{\circ}$ . The prevailing winds of summer are east; those of winter, west and north-west.

**Natural Products.**—Many of the fertile plateaus produce heavy crops of grain, especially where the dews are copious and the natural deficiency of moisture is supplied by irrigation. On the sides of hills too steep to be arable, vines, olives, almonds, figs, and other fruits are often seen growing in great profusion. By far the richest and most fertile tract of Tripoli is that of the Mesheea, which stretches about 15 miles along the coast, with a width not exceeding 5 miles, and has the capital nearly in its centre. The whole of this favoured district is occupied with fertile fields, on which rich crops of wheat, barley, millet, and Indian corn are grown; plantations of productive palm trees, arranged in regular rows; oliveyards, vineyards, orchards, and gardens yielding in abundance, among other fruits, oranges, pomegranates, lemons, figs, apricots, plums, and water-melons. Esparto grass is also very profitably cultivated. The other principal products of the coast are cot-

ton, silk, tobacco, saffron, madder, and castor-oil; in the interior senna, dates, and galls. The fertile region around the capital is inclosed by an immeasurable waste of sand, which forms a striking contrast to the cultivated fields, the edges of which it approaches. The wild trees and bushes are only used to make charcoal, and where this is not to be obtained camel's dung is used for fuel.

Cattle are not numerous in Tripoli, except in Barca, where great numbers are reared on the table-lands, whence they are sent to Bengazi to be shipped to Malta and other places. The domestic animals are horses, mules, camels, sheep, goats, dogs, and poultry. The horses are of a fine breed, and the mules are strong and excellent animals. The most common wild beasts of prey are wolves, foxes, hyenas, and jackals. There are antelopes, gazelles, and hares. Ostriches are only found in the deserts, especially south of the mountain region of Barca. Salt is collected at a few places, but no metals of importance appear to have been discovered, nor are there any but the rudest kind of manufactures.

*Population.*—The Arabs of Tripoli, who compose the bulk of the people, are the same stock as the Bedouins of Arabia. There are two tribes or bodies; one wanderers, and the other fixed residents in villages and small towns. Jews are numerous in the towns and in the villages. The Moors are either landed proprietors or merchants. As the latter they are mostly engaged in the caravans which go to Fezzan and Bornou. The pashalic of Tripoli, like that of the other Barbary states, is a despotism. The country is divided into four *liras* or provinces—viz. Tripoli, Bengazi, Mesurata, and Ghadamcs.

*History.*—The history of Tripoli presents few incidents of importance. Under the Romans it formed a portion of the province of Africa, with the name of *Regio Syrtica*. Early in the third century it was known as the *Regio Tripolitana* (whence its present name), on account of a league consolidated by its three principal cities, Oea, Sabrata, and Leptis. Of the latter the Emperor Septimius Severus was a native, and in memory of his birthplace he elevated the *regio* to the rank of a separate province. In the fifth century it passed, with the rest of Barbary, under the dominion of Genseric and the Vandals, and the seat of the new empire was placed at Carthage. Genseric, in 477, was succeeded by his son Hunneric, chiefly remembered for his cruelty towards the Christians. Then followed Gutamund, Thrasamund, and Hilderic, the latter of whom was deposed by the tyrant Gelimer. In his reign the Emperor Justinian projected an invasion of Africa, and the Vandal power in Barbary was finally overthrown. The Romans retained possession of their conquest until the rise of the Arabs under their Caliph Omar, when the whole of its inhabitants were forcibly converted to Mohammedanism.

About 1552 the Turks under Hayradin, brother of the celebrated Amel Barbarossa, made themselves masters of the province. Tripoli was placed under the control of a dey, who, as the Ottoman power gradually declined, became virtually independent, and at length ceased to acknowledge the sultan's supremacy. In 1835 the Porte resolved to re-establish its sovereignty in this fertile province, and despatched an expedition against Karamanli, the ruling prince, who was defeated and thrown into prison. Since that event Tripoli has formed an eyalet of the Turkish Empire, administered by a pasha who enjoys vice-regal rank. The inhabitants have made several attempts to throw off the yoke imposed upon them, but each insurrection has been easily suppressed.

*Antiquities.*—Most of the towns in the regency possess interesting remains, which are as yet but imperfectly known, particularly in the Pentapolis, where innumerable chambers are hewn out of the rocky hills; some of them with architectural elevations, sculpture, and in-

scriptions. The ruins of temples, theatres, and aqueducts of Roman construction are particularly traceable at Ghrenna (Cyrene), Tauchira (Arsinoté), Ptolemeta (Ptolemais), and Marsa Susa (Apollonia). Lebda (Leptis Magna) has been spoiled of a vast number of its antiquities. At Tripoli Vecchia there is an amphitheatre of Roman construction still entire, 148 feet in diameter, with five degrees of seats; and in the same direction still exists the remnant of one of the great Roman ways, on the borders of which are observable the ruins of ancient buildings in stone.

TRIPOLI, the capital of the above state, and the residence of the pasha, is situated 300 miles south of Sicily. The town is built upon a rocky promontory washed by the sea on the north and east, and connected with the mainland by a sandy plain—the part of which nearest the city, however, is under cultivation. It is defended by high walls and has two gates; one towards the sea, and another opening to the south-east on the plain. It consists for the most part of narrow and uneven lanes, the houses in which are built of irregular stones and mud formed into a mass, and whitewashed. They seldom have an upper storey, and an aperture is rarely seen in the exterior walls, the rooms being entered and lighted from a spacious square yard in the centre of the building. Tripoli contains six large and a number of smaller mosques. The Jews have their synagogues; and the Christians enjoy the free exercise of their religion. The bazaars are extensive. The shops (principally in the hands of the Jews) are miserable-looking hovels, though some of them contain articles of value, such as diamonds, pearls, gold ornaments, rich gems, and scarce drugs. The baths make a considerable show by their picturesque clusters of encolpas. The town also contains some very fine gardens. A kind of Italian is generally spoken by the inhabitants, and in 'na' language Europeans may make themselves understood in transacting their affairs. The population is about 30,000, of whom the Jews reside in a suburb of their own.

The harbour affords tolerably good shelter. It is the only good harbour along the coast for several hundred miles. The trade is carried on in small vessels, seldom larger than brigs. There is direct commerce with England, and some indirectly through Malta, with which it is connected by submarine telegraph. Marseilles, Leghorn, and the commercial towns of the Adriatic and the Levant, likewise have communications with Tripoli. The imports consist chiefly of British cloth manufactures. The value of goods imported has more than doubled in recent years. Ostrich feathers, wheat, and esparto grass form by far the most important articles of the export trade; the demand for the latter has considerably benefited the town and province, and the commerce is increasing. In order to give greater facilities for the shipment of esparto a large concrete pier has been constructed at great cost. Considerable quantities of ivory, barley, butter, and gold dust are also exported. There are several ancient remains in Tripoli, among which the most remarkable is a magnificent triumphal arch, erected in 164 in honour of the Roman emperors Aurelius Antoninus and Lucius Verus.

TRIPOLI, a town of Syria, near the base of Lebanon, 45 miles N.N.E. of Beyrout. The town is well built of stone, and is surrounded by beautiful gardens; the climate is healthy, and the town prosperous. It abounds with ancient and mediæval remains. The district round it is essentially agricultural, and its orchards and gardens are very extensive and valuable; the exports of oranges and lemons are large. Olives give a harvest of oil, estimated at a value of £55,000; grain is also extensively grown, but for home consumption; silk and tobacco are, however, exported to Egypt. Diving for sponges is the principal resource of the inhabitants of the port of Tripoli, and these are sent to Marseilles and Trieste. Tripoli is also the great

market and outlet for the interior districts round Hamah and Homs. The population is about 15,000.

**TRIPOLI EARTH**, so called from its being first obtained from the neighbourhood of Tripoli, in northern Africa, is a well-known polishing powder, almost entirely composed of the silicious (or flinty) skeletons of the microscopical plants termed DIATOMS, as first discovered by Professor Ehrenberg. It is known to the German lapidaries under the name of *polirschiefer*, and is also sometimes quoted in English as *infusorial earth*. The most extensive deposit of the rock hitherto discovered is that met with by the United States Survey in the Kawsoh Mountains, Nevada, which is said to attain a thickness of no less than 250 feet. But one of the principal localities from whence the earth of commerce is obtained is the neighbourhood of Bilin, in Bohemia. The *Berg-mehl* (mountain meal) of Scandinavia is a kind of tripoli, and similar diatomaceous deposits, of greater or less extent, are now found in process of formation on the bottom of many lakes, both British and foreign. See also SILICIOUS DEPOSITS.

**TRIPTYCH** (Gr. *triptuchos*, i.e. in three folds), a folding picture with two wings or doors folding over the central portion, as a cover to it, but all three panels when open forming one harmonious design, and often one picture in three parts: a very frequent arrangement with early Italian painters for altar-pieces, &c. Hence a picture in three panels, or a piece of church carving of such a form, is called a triptych, though it be not constructed to fold up. (The *ch* is usually sounded as a *k* in this word—*triptik*.)

**TRIPUDIUM**, augury by the feeding of birds. See ARGENT.

**TRIREME** (Gr. *trîrês*), the famous war galley of antiquity, with three banks of rowers, whence developed subsequently the quadrireme and quinquireme (Gr. *pentêrês*), with four and five banks. Under this head we shall consider the general subject of the war-ships of the ancients.

The Greeks, with their numerous natural harbours and their many colonies, were the first European people to possess a navy. Even the fleets described in Homer as going against Troy in prehistoric times are respectable in size and in construction. Each of the fifty Bæotian ships, for instance, carried 120 warriors. They were undecked ships, with one mast and a large lugsail, depending far more on the rowers than the sail for their motive power. The anchors were huge stones, and the ships were not anchored afloat, but drawn up on the beach, and if a stay was to be made surrounded with a fortification. Cæsar when he invaded Britain B.C. 54 very nearly lost his ships from this cause, not being used to our high tides; for as he landed at low water the long distance he dragged his ships up the shallow beach was not sufficient to keep them from floating off as soon as the tide came in. Fortunately the alarm was given in time to prevent much damage.

In the classical times of Greece the Corinthians were the first great ship-builders, and to them is due the invention of the trireme, about B.C. 700. The manner in which the three tiers of rowers were arranged will presently be investigated. It was thought that the rowers could better be multiplied in length, and the Ploekians invented during the wars of the great Cyrus (about 550 B.C.) the *pentêrês* (*pentekontoros*), a *nomos* or one-banked ship, but with fifty rowers, twenty-five on each side. But these long vessels were found awkward to manage, and in management consisted the main fighting force. The trireme, too, was the vessel with which the great Persian and Ptolemæan wars were fought. The Athenian trireme was 119 feet long by 14 wide at the water-line, and 154 deep, drawing 8½ feet of water, and of 232 tons register. The quinquireme was 168 feet long, drew 11½ feet, and measured 531 tons. The

triremes were partially decked ships, with three masts, the main mast having two square sails and an extra one if needed, our course, topsail, and topgallant-sail, as well as two triangular sails. The two smaller masts carried fore and aft lateen sails to aid in tacking. There were two rudders, one for each side, but both worked by one steersman. Themistokles induced the Athenians to build a fleet of 200 sail at the time of the Persian War, and to decree twenty new triremes yearly. The Greek mode of sea-fighting was by breaking in the sides of the opposing vessel by means of the ram or beak (*rostrum*), a projecting beam at the prow, just above the water-level, armed with sharp-pointed iron. Later on the rostrum was put under water to conceal it. This attack needed fewer soldiers for boarding purposes than those afterwards used by the Romans, who preferred rather to come alongside their enemy and fight him at close quarters than to endeavour to ram him by superior seamanship and manœuvring. The Athenian trireme had 175 rowers and only 18 soldiers, besides 24 sailors. The Romans, on the other hand, carried 120 soldiers in their big quinquiremes.

Vessels with more than three banks of rowers were not practically used till about 400 B.C., when Dionysios of Syracuse built the first quadrireme (Gr. *tetrês*) and quinquireme (Gr. *pentêrês*). At the time of Alexander the Great the use of these vessels greatly increased (about 330 to 325 B.C.), and ships with twelve and more banks were built. Ptolemy Philopator even built one with forty banks of rowers, but it would only sail in smooth water.

The Romans built triremes for the Samnite War (B.C. 311), but in B.C. 260, when it was evidently necessary to fight Carthage at sea, the Romans seized a Carthaginian quinquireme which was wrecked on the Italian coast, and in two months only they built 130 ships, many of which were quinquiremes. But as it was found at Actium that Mark Antony's Greek-built fleet was overmastered by the help of the light pirate ships, which were all the Romans had, a reaction against heavy ships set in, and speed and lightness were thenceforward rather aimed at. The speed gained was not at all contemptible. Our mail steamers take six and a half days for the transit from Messina to Alexandria, and we know that Balbus did it in six days. Valerius Maximus sailed from Puteoli to Alexandria in nine days.

The mode of arrangement of the rowers in a trireme or quinquireme has given rise to endless discussion, as there is no extant model or description sufficiently full and accurate to show this. It has, however, been generally thought till recently that the three banks of rowers were ranged one above the other (as it were in a sort of "three-decker" arrangement), and as only one man had charge of an oar, it was incredible to think he should have been able to manage such a huge oar as the topmost rower must in such circumstances have possessed.

But in 1883 Admiral Finetti, in searching ancient records at Venice, came upon documents which proved that the triremes of the great republic in her early days, which were of course modelled on the Roman lines, had their rowers arranged not at three levels, but at one level, the three men sitting on the same bench, but the level being slantwise, so that the innermost man was nearer the stern than the outermost man, and the three oars just cleared each other. The effect would be almost like that of an oar with three blades entering the water. The deck of such a trireme would resemble the backbone of a fish, the central walk for the commander representing the spine.

The man nearest the bulwark in these Venetian triremes was called the *terzicco*, and his oar was 29 feet long. The middle man was called the *posticco*, and his oar was 30½ feet long; while the third man, whose post was nearest to the *coria* or middle passage, was called the *pinnier*, with an oar 32 feet long. In front of each bench

was another lower bench or stretcher. The oars were accurately balanced with leaden weights near the handles, and the stroke was given by each man mounting upon the stretcher bench and letting himself fall back in a sitting position on the rowing bench. The weight of the body gave all the force to the stroke, which was very slow and long.

Admiral Fincati presented a model of the Venetian *triremo* to the arsenal of Venice. It explains the whole arrangement of the ancient war-vessel, with its 150 rowers, its helmsman (*kubernités*), its strokesman (*kelenstís*), its watch on the bows (*proratés*). But of even greater value than the model were the practical experiments which he made with barges arranged in the two conflicting methods, the perpendicular and the horizontal. The barges were only one-fifth of the actual size of the Venetian *triremo*—that is to say, they had only ten benches of rowers, with thirty oars. The result was to demonstrate that the perpendicular arrangement was almost unmanageable, while the horizontal arrangement gave the surprising speed of 9 miles an hour. If we could venture to substitute for the Venetian terms the classical terms, the ancient *trireme* and *quinquireme* become intelligible. If the *thalamos* of a Greek *trireme* could be taken to mean not the hull but the bed of the oars (the *tlaro* or framework on which they rested), and if we could explain the *thranités* as the rower at the bench's end (*thr. thraon*, beam ends), then the *thalamités* would correspond to the Venetian *ter-zierio*, the man nearest the *thalamos*, with the shortest oar; the *ugités* would correspond to the *postierio*, the middle man; and the *thranités* to the *planiar*, the innermost rower, with the longest oar and highest pay.

**TRISECTION OF AN ANGLE**, a problem almost like the familiar "squaring the circle," for the amount of labour it has afforded to geometers. The problem is impossible of solution by the Euclidean geometry, which allows only a ruler and pair of compasses, and confines itself to the use of straight lines and circles. But a very slight increase of descriptive power would enable pure geometry to solve the question. In modern analytical mathematics there is no more difficulty in trisecting an angle than in extracting a cube root; ordinary trigonometrical tables solve the question at once to a certain number of places of decimals and the calculation of a series, and the solution of a cubic equation may be made to serve for any number of places of decimals. In order to show this let  $a$  be the sine of the given angle, and  $x$  the sine of its third part, then, by the ordinary rules of trigonometry, we have the equation—

$$3x - 4x^3 = a.$$

Since the value of  $a$  is known (from the trigonometrical table of sines), the equation is easily soluble. The three roots of the cubic equation are found to be the sines of the third part of the angle itself and of angles 120 degrees and 240 degrees more than the said third part. It is the cubic equation which causes the geometrical difficulty, since Euclidean geometry has no power of exhibiting the root of a cubic equation.

But admit the hyperbola among the curves of geometry and the difficulty ceases. For let  $AB$  be a given line: take two thirds of it to form the major axis of a hyperbola whose asymptotes make an angle of 120 degrees; then, with  $A$  as a base, and a point on the branch of the hyperbola adjacent to the single third of  $A$  as a vertex, a triangle be described, the larger of the angles adjacent to  $A$  will always be double of the smaller. Consequently one of the external angles will be triple of its internal and opposite angle; so that by describing on  $A$  a segment of a circle containing the supplement of any angle less than 180 degrees, that circle will cut the branch of the hyperbola in a point which, being joined with the further extremity of  $A$ , will give an angle equal to the given angle.

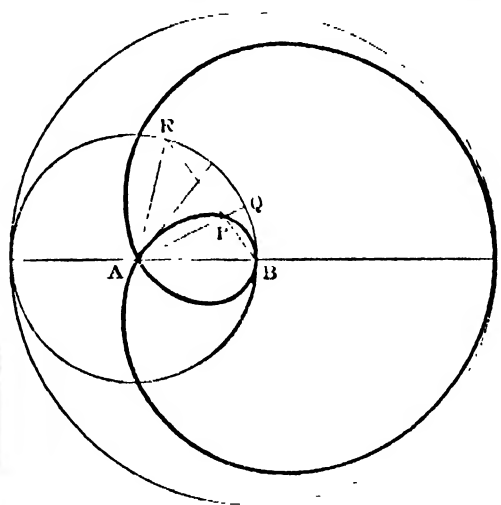
Or, if the conchoid of Nikomedes be allowed, which gives the power of drawing a straight line of given length between any straight line and a curve, so that when produced it shall pass through a given point, the problem is no longer difficult. For, if from any point of a circle a straight line be drawn, cutting the circle again, and passing on to cut a diameter produced in such a way that the part externally intercepted, between the diameter and the circle, is equal to the radius, then the angle formed by that line and the diameter produced, is the third part of the angle made by the two radii, of which one passes through the first-named point of the circle, and the other is on the diameter which was produced.

Either of the curves known by the name of *quadratrix* may be made to trisect an angle, as obviously may also any curve which assigns a straight line equal to a given arc; for a straight line can easily be trisected. The spiral of Archimedes gives another solution. One of the *TRICHOIDAL CURVES*, however, is so eminently adapted for the purpose, that it receives the name of *TRISECTRIX*.

Many nearly true solutions have been effected by pure geometry, and more than once the finest drawing of the construction given has failed to find a flaw in the equality of the third parts into which the angle has been cut. But on such solutions being submitted to algebraical analysis they invariably fail, and it is now universally admitted that it is only the inability to draw points without magnitude and lines without breadth which makes them appear sometimes to succeed. All geometers have finally pronounced the problem insoluble by Euclidean methods.

For practical purposes, and without any extreme accuracy being required, there are several methods of trisecting an angle by mechanical means. Sylvester's tri-vector is the best.

**TRISECTRIX**, one of the *trichoidal* curves, peculiarly adapted to the trisection of an angle. It has the deferent and epicycle equal, the motion in the latter being direct and equal to half that in the epicycle. Or, add and subtract the radius of a circle from every one of the chords



which passes through a point in its circumference, and the result will be a looped curve, which is the trisectrix. Let  $A$  be the point where the branches unite, and  $AB$  the axis of the loop, describe a circle with  $A$  as a centre and  $AB$  as a radius; take a point  $P$  in the loop, and let  $AP$  and  $BP$  produced meet the circle in  $Q$  and  $R$ . Then the arc  $BR$  is three times  $BQ$ .

**TRISMEGISTUS**, or the *Thrice-great* (properly *Trismegistos*), was an epithet given to the Egyptian

Hermès by the Neoplatonists and the alchemists. He is said to have invented the art of writing, and to have first taught the sciences of astronomy, astrology, &c. See **HERMES TRISMEGISTOS**.

**TRISTAN D'ACUNHA**, a group of islands in the Southern Atlantic, S.S.E. of St. Helena, and E.S.E. of the Cape of Good Hope. The islands are three in number; the largest, to which the name of Tristan d'Acunha properly belongs, is between 19 and 20 miles in circumference; of the two smaller, that which is named Nightingale Island lies to the south, and that named Inaccessible Island to the south-west. Water is good and abundant in the large island, and vessels touching there can easily procure supplies of fresh provisions. These islands were discovered in 1506 by the fleet under Tristan d'Acunha, a Portuguese naval commander, whose name they have ever since borne. They are claimed by Great Britain, and an English garrison was maintained here during the captivity of Napoleon I. at St. Helena.

In 1811 three Americans had settled in the principal island, and one of them, named Jonathan Lambert, had proclaimed himself sovereign proprietor; but the little colony was soon afterwards abandoned, and possession formally taken by the British government. Several families voluntarily emigrated there, and a corporal, named Glass, was chosen by them as "governor." In 1824 the population numbered twenty-two men and three women. In 1836 it had increased to forty-two, who cultivated an extensive tract of ground, and grew wheat, barley, oats, potatoes, carrots, onions, pumpkins, and other vegetables, besides breeding bullocks, cows, sheep, hogs, goats, rabbits, and poultry.

The island has been visited several times by men-of-war, on the last occasion in 1886, and all accounts agree in reporting the inhabitants to be remarkably healthy, contented, clean, neat, and apparently free from the usual vices of civilisation. When the population increases beyond the number which the resources of the island can conveniently support, the surplus is disposed of by emigration to the Cape. The coarse but nutritious tussock-grass affords good pasturage for cattle, &c., and vegetables thrive, but breadstuffs have to be obtained from passing vessels, as corn will not withstand the force of the heavy gales.

Tristan d'Acunha is situated in 37° 6' S. lat., and 12° 18' W. lon., about 1320 miles to the south of St. Helena. Its mountain peak attains an elevation of 8350 feet. The number of inhabitants averages about 110.

**TRISTRAM** and **YSEULT** (or *Tristan and Isolde*), a famous subject of the minnesingers and ballad-writers of the dark ages, and often repeated by later poets. It serves also as the story of one of Wagner's finest operas. Sir Tristram was one of Arthur's Knights of the Round Table. He was nephew of Mark, king of Cornwall, and being sent to bring Yseult, a princess of Ireland, to her marriage with Mark, he and the princess, by pure accident, drank a love potion, so that he fell in love with her and she with him. The intrigue was discovered, and Sir Tristram banished. He married another Yseult, called "of the white hands," princess of Brittany. Being wounded to death and assumed of cure at the hands of his aunt and former lover, the latter is sent for, but Sir Tristram's wife, watching for the ship, is overcome with jealousy, knowing that her husband has never ceased in his first love, and wrongly tells the knight that the agreed signal (a white sail) is wanting and Yseult of Cornwall has not come. On this the unhappy man tears off his bandage, and his would-be deliverer approaches, hurrying from her ship to save him, only to be in time to receive his last breath.

**TRITICUM**. See **WHEAT**.

**TRITON**, a well-known figure of the Greek mythology. He was the son of Poseidon, by his queen Amphitrite. Triton is always represented with a curved shell or conch (*concha*), which he blows upon when attending his father

to calm the angry waves. He rides a dolphin or other sea-monster. Later poets included all the sons or attendants of Poseidon under the term, and represented them as mermen—that is, as fishes all below the waist.

The beautiful sonnet of Wordsworth upon the waning power of nature over the imagination ("The World is too much with us") concludes with some marvellously beautiful lines upon these ancient sea-gods—

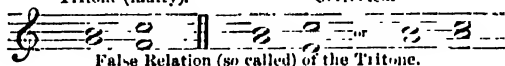
"Great God, I'd rather be  
A pagan suckled in a creed outworn,  
So might I, standing on this pleasant lea,  
Have glimpses that would make me less forlorn;  
Have sight of Proteus rising from the sea,  
Or hear old Triton blow his wreathed horn."

**TRITON**. See **NEWT**.

**TRITONE** (*i.e.* three-toned interval), the musical interval of the Augmented Fourth, or of the Diminished Fifth, each of which contains six semitones—that is, three tones. The tritone is an exceedingly awkward interval to deal with in writing music, as it is a discord of such force as to suggest a modulation. It occurs naturally in the scale, between the subdominant and the leading note—that is, between F and B in the scale of C. In the strict style it is even forbidden to occur between the upper note of one chord and the lowest note of the next chord, or *vice-versa*: for in such a case it seemed to the more sensitive ears of our forefathers, unused to the strong discords which we can enjoy without flinching, as a *false relation*.

Tritone (faulty).

Corrected.



False Relation (so called) of the Tritone.

**TRITYL** or **PROPYL** is the third radicle in the series of hydrocarbons ( $C_nH_{2n+1}$ ). The formula is  $C_3H_7$ , but it is not definitely known in the free state; it is probably identical with the hydride of hexyl found in American petroleum.

Isotrityl or isopropyl has been obtained. It is a colourless liquid having the same formula, and the specific gravity 0.676; the boiling point is 58° C. (136° Fahr.) Isotrityl or isopropyl alcohol ( $C_3H_8O$ ) is a colourless liquid, having the specific gravity 0.791, and boiling at 83° C. (181° Fahr.); when oxidized by chromic acid it yields acetone ( $C_3H_6O$ ).

**TRITYLAMINE** or **PROPYLAMINE** ( $C_3H_7N$ ) is a base isomeric with trimethylamine, which it closely resembles. It is a colourless highly refracting liquid, very soluble in water. It boils at 50° C. (122° Fahr.) The solution precipitates many of the metallic oxides, acting like ammonia. It combines with acids, forming crystalline deliquescent salts. The formula of the chloride is  $NC_3H_7HCl$ ; that of the chloroplatinate is  $2NC_3H_7HCl \cdot PtCl_4$ .

**TRITYLENE** or **PROPYLENE** ( $C_3H_6$ ) is the olefine of the trityl group. It is a colourless gas, soluble in water, and, like ethylene, it combines with chlorine and bromine, forming the compounds  $C_3H_4Cl_2$  and  $C_3H_4Br_2$ . Tritylenic alcohol or propylglycol ( $C_3H_8O_2$ ) is a sweet oily liquid soluble in water. The specific gravity is 1.051; the boiling point is 188° C. (370° Fahr.)

**TRIUMPH** (*Triumphus*) is in general a solemn procession for the purpose of celebrating a victory. Such processions have been customary in all warlike nations, but they have never formed so prominent a feature in the history of a people as among the Romans. The appearance presented by Rome on the occasion of these festivals was joyous in the extreme. Work was suspended, it being a day of general holiday; the temples were thrown open, and decorated with flowers; the populace, clad in their gayest attire, crowded every elevated place from which a view of the procession could be obtained; and banquets were spread before every door. The *imperator* himself,

the hero of the day, after pronouncing a eulogy on the bravery of his soldiers, ascended his triumphal car, and entered the city by the *porta triumphalis*, where he was met by the senate, and where the procession really began. Headed by the magistrates, the senate marched first, next came a body of trumpeters, then a train of carriages and frames laden with spoils, after which appeared a body of flute-players, followed by the oxen to be sacrificed, and the sacrificing priests, &c.; then came the distinguished captives, with bands of inferior prisoners in chains, and after them the lictors, having the fasces wreathed with laurel. Finally the *imperator* himself, in a circular chariot, attired in a gold-embroidered robe (*toga picta*) and flowered tunic (*tunica palmata*), bearing in his right hand a laurel bough, in his left a sceptre, his face painted vermilion, and his brow garlanded with Delphic laurel. Accompanying him were his grown-up sons, his other children, and intimate friends, the legates, tribunes, and equites riding behind. The rear was brought up by the remainder of the soldiers, singing or jesting at their pleasure, it being a day of carnival and license. On the arrival of the procession at the Capitoline, some of the captive chiefs were taken aside and put to death; after which the oxen were sacrificed, and the laurel wreath placed on the brow of Jupiter. A public banquet was given in the evening, and the general on some occasions was even provided with a site for a house at the public expense. Such a triumph was the highest honour that a military commander could look for; it was granted by the senate after any victory, provided certain conditions had been complied with, and if it was thought sufficiently important to deserve it. Among the principal conditions on which the triumph was granted, were (1) that the general should have held one of the great offices of the republic, either the dictatorship, consulship, or prætorship; (2) that the advantages gained by the victory, and the number of enemies slain, should come up to the amount prescribed by law; (3) that the victory should have been gained over a foreign enemy, and not in a civil war; (4) that the dominion of the Roman people should have been extended by the victory, and that it should not be a mere reparation of losses previously sustained; (5) that the war should be actually concluded by it, so as to enable the army to quit the enemy's country.

During the empire, the emperor himself, being the chief general of all the armies, was the only person that could claim a triumph, and it was rarely if ever granted to any one else but a member of the imperial family. Inferior generals received other compensations. All the triumphs that had been celebrated at Rome were carefully recorded in the *Fasti Triumphales*, and their total number, from the earliest times down to the last, that of Belisarius over the Vandals, has been calculated to amount to 350.

A lesser kind of triumph was called *Oratio*, perhaps from *oris*, a sheep, which the general offered to Jupiter instead of a bull. It was granted after victories which were not of sufficient importance to deserve the solemn triumph. The principal difference between the two was that in an ovation the general entered the city on foot, and in later times on horseback; he wore only the *toga prætexta*, and his brow was adorned with a wreath of myrtle. He carried no sceptre, and was frequently not accompanied by his army.

**TRIUMVIRS** (*triumviri* or *tresviri*), that is, "three men." A great number of offices at Rome, both ordinary and extraordinary (commissions), were held by three persons in conjunction, who thus formed a board which was intrusted with the management or administration of certain affairs. The office itself was called *triumvirate*. Extraordinary triumvirs were appointed on various occasions and emergencies; for example, when a new colony was to be founded, the whole management of the business, to-

gether with the distribution of lands among the colonists, was usually intrusted to triumvirs, whose full title was "*triumviri coloniæ deducendæ*," or "*agrorum dividendo*."

The *triumvirate* which has acquired the greatest celebrity in the history of Rome is that which was established towards the end of the republic by Octavian (Augustus), Mark Antony, and Lepidus, B.C. 43. Their power and its duration was sanctioned by a *senatus consultum*, and is usually called the second *triumvirate*. The first *triumvirate*, if we may call it so, was merely a private coalition entered into between Cæsar, Pompey, and Crassus, the three most powerful men of their time, the object of which was to carry out their own schemes of political aggrandizement in spite of the opposition of the senate. The title of *triumvirs* was perhaps never borne by them; it was certainly not recognized either by the senate or the people.

The regular *triumviri* belonged to the minor magistrates. Among them we shall mention:—1. The *Triumviri Capitales*, who were instituted about the year B.C. 292, and were in many respects the successors of the *questores paricidii*. They inquired into capital offences, apprehended criminals and committed them to prison wherever they discovered them, and also carried into effect the sentence passed upon them. 2. The *Triumviri Monetales*, or the inspectors of the mint. 3. The *Triumviri Nocturni*, whose duty it was to superintend the watchmen in the city at night, and to prevent or put out fires in the city.

**TRIURIDÆ** is a small order of flowering plants belonging to the class *Monocotyledons*, series *Apocarpæ* [see *BOTANY*]; it is closely allied to the order *ALISMACEÆ*. The species are native of the tropical forests in both hemispheres, found growing on decaying vegetable matter. They are small, slender, colourless herbs, with leaves usually represented by small scales. The flowers are small. The species are not numerous.

**TRIVIAM** was the name of a famous mediæval group of faculties at the great universities. The three faculties of the Trivium were grammar, logic, and rhetoric. The Quadrivium (arithmetic, geometry, music, and astronomy) completed the circle of the *Seven Liberal Arts*.

**TROAD.** See *TRIOX*.

**TROCHEE** and **TROCHAIC VERSE**, terms of ancient prosody. The trochaic verse was used by the Greek and Latin poets, especially by the tragedians and comedians. The foot from which it takes its name and of which it principally consists is the trochee (— —), whose motion has been excellently imitated by Coleridge in his well-known verse,

"Trochee steps from long to short."

The trochee is combined, like the iambus and anapaest, into metres of two feet each (dimeters). The most common form of trochaic verse is that which is composed of a perfect dimeter, followed by a dimeter wanting the last half-foot. This form of verse is the "*trochaic tetrameter catalectic*" of the Greeks, which was also called by the Romans *quadratus*, from its containing four metres, and *septenarius*, from its containing seven complete feet.

The "*trochaic tetrameter catalectic*" gets its name from its containing four metres, each alternate line wanting the last syllable. As, therefore, there were only seven feet and one syllable in the two lines, the Romans often called the metre *septenarius*. It has a good swing with it, and may be made brilliantly dramatic in effect. The following is an example in English, representing quantity by accent:—

Alexander ha'ted thi'inking,  
Drank around the coun'cil board,  
He subdue'd the world by drink'ing  
More than by his co'nquering swo'rd.

**TROCHIDÆ** is a family of molluscs belonging to the order *GASTEROPODA*. In this family the shell is spiral, top-shaped, or pyramidal, with the aperture entire and

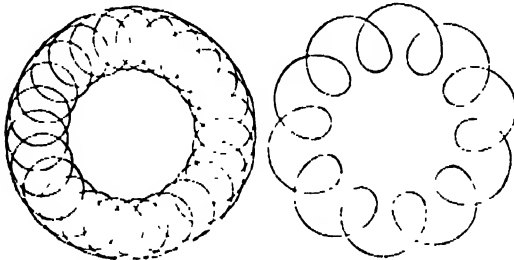


nearly circular, closed by a horny operculum, which is usually covered externally with shelly matter. The shell is generally brilliantly pearly when the epidermis and outer layer of shell have been removed, and is often used for ornamental purposes. The animal has a short proboscis; the eyes are situated on stalks at the outer bases of the tentacles, which are long and slender; the head and sides are ornamented with fringed lobes and filaments. The species are numerous and are found in all seas, the animals feeding on seaweeds. The principal genera are *Trochus*, *Turbo*, *Phasianella*, and *Imperator*.

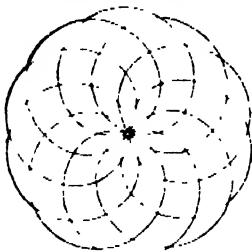
**TROCHILIDÆ.** See HUMMING-BIRD.

**TROCHOIDAL CURVES** (Gr. *trochos*, a hoop). This large class of curves comprises all those which are formed by the combination of two circular motions; including the straight line, the circle, the ellipse, the epitrochoids and epicycloid, the hypotrochoids and hypocycloid. If one of the motions is rectilinear we get the common trochoid, the cycloid, and a class of spirals which includes the involute of the circle, the spiral of Archimedes, and others.

The greatest use of trochoidal curves is in astronomy; for the motions of a satellite round a planet and the planet round the sun give exactly the combination required to produce a typical trochoid. The great circle swept round



Trochoidal Curves.



Trochoidal Planetary Curve with equal Deferent and Epicycle

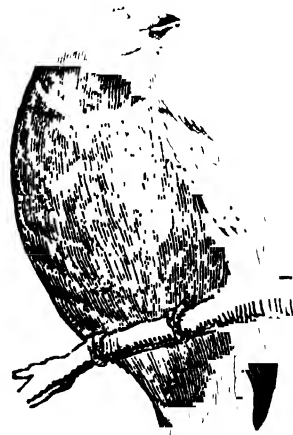
by the planet is the circle or *deferent* of the system, the small circle of the satellite is the *epicycle*, and since the shape of the curve depends altogether upon the relative motions of these two elements, it was the great problem of the Ptolemaic system of astronomy (which regarded the earth as the centre of our universe) to combine cycle and epicycle so as to produce the exact path of the planets in space. The curve which *Kepler* gives us the motion of the planetary satellites the Ptolemaists used to explain the motion of the planets themselves; for if the earth is stationary, then on this theory the path of the sun is a great deferent, and the planets move round him in epicycles, much as the satellites really do move round their revolving planet in the astronomical theory. The curious mixture of direct and retrograde motions of the planets in the heavens, as seen from the earth, the loops formed by their paths, and all their apparent irregularities, which we so easily explain by taking the sun as the centre of the system, they used to accomplish with the help of intricate trochoidal

curves, adding epicycle on epicycle as increased observation demanded further corrections.

The usual way of studying trochoidal curves is, however, by considering one circle to roll within or upon another. If it roll within, we get *hypotrochoidal* curves; if it roll without, so that the two convexities are opposed, we get *epitrochoidal* curves; and the terms *hypocycloid* and *epicycloid* refer to the case in which the point tracing the curve is on the circumference of the rolling circle. Regarded from this point of view, when the deferent and epicycle are equal the epicycloid is a circle and the hypocycloid a straight line. The other epitrochoids and hypotrochoids take various extreme forms.

**TROGLODYTES** (Gr. *trōglē*, a cave, *duō*, I enter). Under this term the ancients appear to have comprised more than one race of men. The principal race, that referred to by Pliny as excavating caves for habitations, feeding on serpents, and expressing their idens by inarticulate sounds, is included by him among the *Æthiopiæans*, and placed on the west coast of the Red Sea.

**TROGON** (Trogonidae) is a family of birds belonging to the order *Volitores*, remarkable for the beauty of their plumage. The toes are of unequal length, and arranged in two pairs. The bill is short, stout, broader than high, and presents a triangular outline when seen from above; the edges and tip of the mandibles are usually toothed; the gape is wide. The tarsi are short and feeble, often feathered almost to the toes. The general contour of the body is full and rounded, and the plumage is dense, soft, and deep.



Mexican Trogon (*Trogon mexicanus*)—male.

The wings are short, but pointed; the tail is long, ample, and graduated; the tail-coverts are elongated and pendent. The trogons are all inhabitants of tropical regions, but



the majority are peculiar to the New World, thirty-three of the forty-six known species being found in America. Two species only are known from Africa, the rest of the Old World forms being natives of India and the Malayan region. In the brilliancy of their plumage they are surpassed only by the humming-birds. They are sometimes called Courcoucous, in imitation of their note. They are described by Gould ("Monograph of the Trogonidae") as inhabiting the deepest recesses. They are sometimes seen on the summits of trees, but in general they prefer the centre, where they remain a portion of the day without descending to the ground, or even to the lower branches. Here they lie in ambush for the insects which pass within reach, and seize them with address and dexterity. Their flight is lively, short, vertical, and undulating. Though they thus conceal themselves in the thick foliage it is not through distrust, for when they are in an open space they may be approached so nearly as to be struck with a stick. They are rarely heard to utter any cries, except during the season of reproduction, and then their voice is strong, sonorous, monotonous, and melancholy. They have many cries, from the sound of one of which their name is derived. All those whose habits are known nestle in the hollows of worm-eaten trees, which they enlarge with their bills so as to form a comfortable and roomy residence. The number of eggs varies from two to four. Their food consists of larvae, small worms, caterpillars, beetles, fruits, and berries, which they swallow entire. The Old World species are insectivorous, while the American species are chiefly fruit-eaters.

The Cuba Trogon (*Trogon tenuis*), which measures about 10 or 11 inches in length, has the crown of the head of a violet-blue colour, the upper surface of the body brilliant metallic-green, the throat and breast grayish-white, and the belly vermillion. The scapulars and the great coverts of the wings are green, with a white spot near the extremity of each feather; the quill feathers of the wings are black, adorned with white spots, and those of the tail green or blue, spotted with white. This bird is chiefly remarkable for the peculiar form of the tail, each feather of which is truncated at the extremity, with its exterior angle produced outwards, so that, as the general form of the tail is, or rather would be, wedge-shaped, its whole apical half is surrounded by a series of points. It is a beautiful species, which has only hitherto been found in Cuba, where it is very common in the woods. Its note, which is heard in the morning and evening, is described as resembling the syllables *to-corr*. This species is said to feed upon vegetable substances. It sits in a very passive state upon the branches, and is easily killed; great numbers are destroyed for the table, their flesh being very good.

The Mexican Trogon (*Trogon mexicanus*), which is about the same size as the preceding species, is of a fine brilliant green colour on the upper surface, with the breast and belly scarlet; the throat and ear coverts are black, and the neck is encircled with a white crescent; the wings are black, with gray markings; the long tail is black, tipped with white; the two middle feathers green, with black tips. The Long-tailed Trogon or Quetzal (*Pharomacrus mocino*) is one of the most magnificent of the trogons, or indeed of any birds.

#### TROJA, TROJAN WAR. See TROY.

**TROLLHATTA**, a village of Sweden, 8 miles S.S.W. of the south-west angle of Lake Wener, on the Gotha, with a canal constructed for avoidance of the falls on the Gotha, for which this place is celebrated. The river first forms one fine fall at the village, and then a succession of rapids, between high rocky banks, covered with dark woods. The canal is 6500 yards long, with fifty-three locks, and was mostly formed out of solid granite rock. The difference of level between the point where it joins the river below the falls and its highest part, is about 120 feet; minimum depth, 15 feet. It was constructed (1783

to 1800) by a company of merchants, and improved (1834 to 1844), and yields a large dividend. The falls of the Gotha are the highest in Europe of the same body of water, and the most magnificent, for a cataract depends for imposing effect more upon the volume it discharges than the extent of the descent. The river, broad and deep, plunges 130 feet in successive leaps.

**TROLLOPE, ANTHONY**, a popular English novelist, was the son of a barrister and of Mrs. Francis Trollope (1778-1863), the authoress of clever novels—"Widow Barnaby," &c., of a book of travels entitled, "The Domestic Manners of Americans," and "The Life and Adventures of a Clever Woman." Trollope, who was born in 1815, went to Harrow School for three years, thence to a private school at Sunbury, afterwards to Winchester School, and finally back again to Harrow. For a short time he was a master in a school at Brussels. In 1834 he became a clerk in the Post Office. His autobiography furnishes some entertaining reminiscences of his official career. In 1841 he went to Ireland as a surveyor's clerk, and here lived at Banagher, on the Shannon, where he learned to ride to hounds. In 1844 he married, and in 1847 and 1848 he published his first two novels, "The Macdermotts of Ballycloran," and "The Kellys and the O'Kellys," but these works and their successor, "La Vendée," were an unqualified failure. In 1855 he published "The Warden," the first of a group of novels which described with admirable fidelity the more dignified life of the country, and in which country gentlemen and provincial parsons are portrayed with remarkable skill and insight. "Barchester Towers" (1857) was followed by "The Three Clerks" (1857), "Doctor Thorne" (1858), "The Bertrams" (1859), "Franklin's Parsonage" (1861), "Orley Farm" (1862), "Rachel Ray" (1863), "The Small House at Allington" (1864), "Can You Forgive Her?" (1864), "The Belton Estate" (1865), "Miss Mackenzie" (1865), "The Last Chronicle of Barset" (1867), "The Claverings" (1867), "Lotta Schmidt and other Stories" (1867), "He Knew he was Right" (1869), "Phineas Finn" (1869), "An Editor's Tales" (1870), "Sir Harry Hotspur" (1870), "The Vicar of Bullhampton" (1870), "Ralph the Heir" (1871), "The Eustace Diamonds" (1872), "The Golden Lion of Granpere" (1872), "Phineas Redux" (1873), "Harry Heathcote" (1874), "Lady Ann" (1874), "The Prime Minister" (1875), "The Way we Live Now" (1875), "The American Senator" (1877), "Is He Popenjoy?" (1878), "Cousin Henry" (1879), "The Duke's Children" (1880), "Marion Fay" (1882), and "The Land Leaguers," published posthumously. In several of the later novels the interest is chiefly political, centring round the Duchess of Omnium. He went on several missions for the Post Office, and also travelled independently, embodying the result of his observations not only in his fictions, but in several interesting books of travel. He published "The West Indies and the Spanish Main" in 1859, "North America" in 1862, these being followed by "Travelling Sketches" (1866), "Tales of All Countries" (1861-70), "Australia and New Zealand" (1873), "New South Wales and Queensland" (1874), "South Australia and Western Australia" (1874), "Victoria and Tasmania" (1874), and "South Africa" (1878). He also wrote "Hunting Sketches" (1865), "Clergymen of the Church of England" (1866), a "Life of Cæsar" in the Ancient Classics for English Readers, a "Life of Thackeray" in the English Men of Letters Series, and numerous magazine articles—one a defence of field sports against Professor Edward Freeman, another a sketch of his friend George Henry Lewes. The "Life of Cæsar" has received the highest commendation from Professor Freeman the historian, and the "Life of Thackeray" is of interest as being the first biography of that distinguished man. Trollope died 6th December, 1882. His life is pleasantly told by himself in his "Autobiography," edited by H. M. Trollope

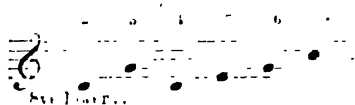
(1883). See also Professor Freeman's article on Trollope in the *Fortnightly Review* (1882).

**TROM'BA** (Ital.) See **TROMPER**.

**TROMBA MARINA** or **TRUMPET MARINE** is a stringed instrument, played with a bow, and not, as its name would seem to imply, of the trumpet family. It gets its name from a peculiar trumpet-like quality of tone, produced by the position of the bridge. The *tromba marina* is merely a triangular resonance-box about 7 feet long and very narrow, across which a very thick gut-string is stretched, passing over a bridge slightly uneven on its feet, one foot being a fixture. On being bowed the loose foot of the bridge vibrates with great rapidity, striking the soundboard harshly and checking the vibration with a sort of clang, whose repetition strongly resembles the well-known peculiarity of the trumpet tone. The player does not press the string home, but touches it somewhat lightly, playing therefore always in harmonies. The Old German name for the instrument is *trundelsack*.

**TROMBONE** (Ger. *Posaune*). This is the largest instrument of the trumpet family (Ital. *tromba*, trumpet, whence, by adding the augmentative *-one*, we get *trombone*, a very large trumpet; just as *cloroba*, from *clorid*, &c.) Its tone is so marked that it was long withheld from the orchestra. Mozart used trombones magnificently upon occasion, but very sparingly resorted to them. And Handel and Bach had preceded him in this cautious care. So a fine painter may use a touch of scarlet for a special effect. But Weber, Schubert, and Mendelssohn all made the trombones one of the regular constituents of a full orchestra, and we now get almost too much of them at the hands of modern composers, unaware of the mighty power of reticence. Alluding to this, Mendelssohn always declared that he regarded the trombones as "sinned instruments." His own use of them, as in the "Hymn of Praise" of the "Athene" music, is alone beyond compare with the rich harmonies continued in many of the very greatest masters. Both women, for example, must sit as well as Mozart with his trombones.

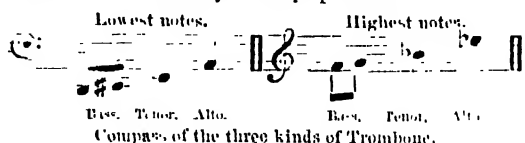
The trombone is a "slide" instrument—that is, part of the tube being bent to and fro, in order to slide over the several positions of the tube, so that the length of the tube is variable to a very large extent; and since the full trumpet scale is available at every position of the tube, it is evident that the number of sounds and the degree of inflection as possible upon the trombone are almost infinite. The notes actually employed in each position are the harmonies 2, 3, 4, 5, 6, 7; 7 being omitted because it is very different from the 7 of the trumpet scale. The first harmonic, that produced by the vibration of the whole length of the column of air, is rarely used, and is impossible to produce with the ordinary embouchure. The harmonies actually used when the instrument is set for C as its fundamental tone are *c, g, c', c', g', c''*—



But as this series of notes may be produced starting from any other keynote, and as the number of slides of tone between keynotes is infinite, therefore any scale can be easily played on the instrument.

The *tenor* of trombone are in ordinary use, and these are called the *tenor*, and *bass* varieties. The *alto trombone* is in the key of B $\flat$ , this being the key when closed. By pulling out the slide, and so lengthening the tube, the instrument can be made to play in D, D $\flat$ , C, B, B $\flat$ , and A. It can therefore play the whole chromatic scale from A to c $\sharp$ ; but the lower notes are of a finer quality when played on the *tenor* trombone. The *tenor trombone* is the most important of the group. Its natural

pitch is B $\flat$ , and it commands as great a range as the *alto* trombone at a Fourth lower in pitch. The *bass trombone* is made in various sizes, the most usual being in G and in F, that is, a Third and a Fourth respectively below the *tenor* trombones. French composers are fond of using three *tenor* trombones, but in England and Germany one trombone of each variety is always preferred.



The splendour of full chords *piano* on the trombones and horns cannot be surpassed. The majesty of their use in sacred music as a soft accompaniment to the voice is peculiar to themselves; and this effect was perhaps first brought to perfection by Mozart in the *Zauberflöte* ("O Isis and Osiris," &c.) But the temptation to use the great force the trombones possess is too often not withstood either by composer or executant, and a coarse vulgarity is the immediate result.

Solos on the trombone have a remarkably fine effect in the hands of good players. The noblest opportunity in the scores of the great masters is the trombone solo in Mozart's Requiem ("Tuba Mirum").

**TROMP, CORNELIS VAN**, second son of the great admiral, was born at Rotterdam, 9th September, 1629. He was educated for the navy; and at the age of twenty-one commanded a ship in the expedition despatched, in 1659, against the Emperor of Morocco. In 1652 and 1653 he served in the *Montenation*, distinguished himself in various engagements, and was made rear-admiral. In 1666, when war with the land commenced, Van Tromp was attached with his squadron to the fleet commanded by Wassenaar van Opdam. In the first action with the Duke of York, 13th July, the Dutch were beaten, but Van Tromp greatly distinguished himself.

In 1666 he accepted the command of the *Holland*, of eighty-two guns, and was present at the victory which Ruyter gained over the English, 11th June and four successive days. Another engagement took place, 14th August, which was renewed on the 5th. Van Tromp had the advantage over the vice-admiral (Smith) who was opposed to him; but Ruyter was worsted. The latter attributed his defeat to Van Tromp's neglect to support him, and complained of his misconduct. Van Tromp retorted, but the State deprived him of his commission, and placed him under preventive arrest at the Hague.

In 1673 his commission was restored to him by the stadtholder, afterwards William III., and a reconciliation took place between him and Ruyter. In the engagements of 7th June and 14th, with the allied fleets of France and England, he displayed the most reckless courage; but on both occasions he was indebted to Ruyter for bringing him off when he had engaged himself too far.

A descent on the coast of France was projected by the States, in 1674, and Van Tromp was appointed to carry it into execution; but the result was unsuccessful. In 1675 he visited England, and was created a baron by Charles II. In 1676 he was despatched with a fleet to assist the King of Denmark in his war with Sweden. Van Tromp, on his return to Holland, was appointed lieutenant admiral general of the United Provinces. He accompanied the Prince of Orange in the expedition against St. Omer. After this he retired from public life till 1691, when he was induced to accept the command of a fleet against France, but died at Amsterdam, 21st or 29th May, before its equipments were completed.

**TROMP, MARTEN HARPERTZ ZON VAN**, the famous Dutch admiral, was the son of a Dutch naval officer.

and was born at the Briel in 1597. He was present with his father at the engagement between the Dutch and the Spanish fleets under the cannon of Gibraltar, 25th April, 1607; and not long after, his father being killed in an engagement with an English cruiser, and his ship captured, the lad was detained two years and a half a prisoner. For some years after this adventure his career was obscure. In 1622 we find him a lieutenant on board a ship of the line; and two years later Prince Maurice gave him the command of a frigate.

In 1637, after a long period of inaction, Van Tromp was made lieutenant-admiral, and received the command of a squadron of eleven ships, with which, in 1637 and 1638, he took so many vessels from the Spaniards that the States presented him with a gold chain, and the King of France conferred upon him the order of St. Michael. In April, 1639, Van Tromp again set sail to cruise against the Spaniards. On 15th September, with only twelve ships in company, he came in sight of a large Spanish fleet off the coast of Sussex. After making several indecisive attacks, he, on 13th October, again came up with it, and by this time both sides were much strengthened. The action commenced on the 21st. The result was that Van Tromp gained a complete victory, and thirteen richly laden galleons fell into his hands.

He also rendered important services to his country in the wars of 1610 and 1611; and after Cromwell had seized the helm of government in England, was opposed on the seas by his great rival Blake, who frequently defeated him. [See BLAKE.] In his last battle the Dutch admiral was attacked by Monk, duke of Albemarle. The fleets engaged 29th July, 1653. Both sides claimed the victory; but the Dutch suffered an irreparable loss by the death of Van Tromp.

**TROMSOE**, a small seaport of Norway, and an out-port of Hammerfest, is situated on an island within the Arctic circle. Its harbour is convenient and much frequented for the whale fishery, and large quantities of cod, oil, herrings, and nickel ore are exported. It is the seat of a bishop, has an interesting cathedral (of which the inhabitants are very proud), another church, a seminary, and a busy trade, especially with Hamburg. The population is about 6000.

**TROMDHEIM**. See DRONTHEIM.

**TROPEOLUM** is a genus of plants belonging to the order GYNÆCEÆ. The species are all inhabitants of South America, and are mostly climbing plants. The flowers are showy and irregular, with five sepals produced into a spur behind, five or fewer petals, free stamens, and a three-lobed, three-celled ovary, which ripens into a fruit composed of three indehiscent berries. The whole plant possesses an acrid taste and odour, similar to that which exists among the Cruciferae. It is on this account that the species of *Tropeolum* have received the popular name of *Nasturtium*, which properly belongs to a genus of Cruciferae containing the watercress; whence also the name Indian Cress applied to these plants.

*Tropeolum majus*, the great Indian cress or Nasturtium of our gardens, was introduced into this country from Peru. It is a hardy annual, climbing among bushes or on trellises, by means of the long twining petioles of the leaves. The flowers are large and showy, orange marked with reddish-brown. The flowers and young leaves are used in salads, and the fruit when green is made into a pickle.

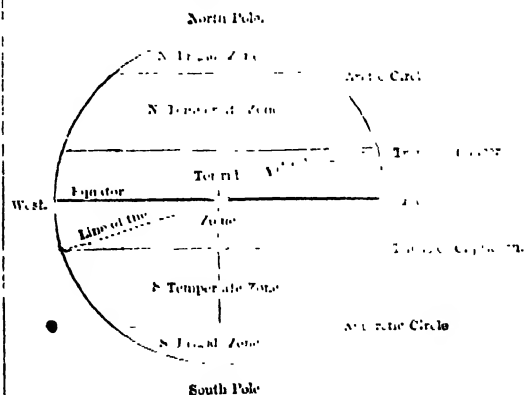
*Tropeolum minus* (small Indian cress or Nasturtium) is also a native of Peru. It has been long cultivated in our gardens, like the preceding species, which it closely resembles, except in being much smaller and of weaker growth. Its fruits are preferred for pickling. Several other species are cultivated in gardens for the beauty of their flowers, thriving in a light, rich soil; some require greenhouse cultivation. One of the most common is the

Canary Creeper (*Tropeolum peregrinum*), which climbs rapidly and to a considerable height, by twining the petioles of its leaves. *Tropeolum tuberosum* has tuberous roots which are eaten, when boiled, in Peru.

**TROPHY** (Lat. *tropæum*, Gr. *trophaion*, from *tropé*, a putting to flight—the *h* in the English being an intrusive letter), among the ancients, was a monument or memorial in commemoration of some victory. It was originally erected on the spot where an enemy had been conquered or put to flight. It was a practice among the Greeks seldom to erect trophies in any other place than the field of battle. A trophy in Greece after a victory on land appears to have consisted of a trunk of a tree, fixed on some eminence and adorned with the spoils and armour of the vanquished. An inscription usually recorded the names of the conqueror and the conquered, and the whole trophy was dedicated to some divinity. After a sea-fight the trophy consisted of the beaks and stern ornaments of the captured vessels set up on the nearest coast. The Romans, down to the latter period of the republic, never erected any trophies; the spoils of a vanquished enemy were partly distributed among the soldiers, partly dedicated in the temples of the gods, and partly applied as ornaments for other public buildings and places. When, however, they adopted the custom of raising trophies on the field of battle, these usually consisted of more solid structures than those of the Greeks—such as towers, columns, &c.

**TROPIC-BIRD** (*Phaethonidae*) is a family of sea-birds belonging to the order ANSERES, sub-order Steganopoda. These birds have the feet clothed with feathers, the bill strong, long, and pointed downwards, the wings long, and powerful, and the feet feeble. The tail is provided with two very long central feathers. These species only are known, all confined almost entirely within the tropics, where they are seen in mid-ocean, all wing in the wake of vessels, and are called Boatswain birds by sailors. They breed on rocks and small islands, laying only one egg. Their food consists of crabs and other crustaceans, and also of fish. The Common Tropic-bird (*Phaethon ethiops*), found in the Atlantic, is about the size of a pigeon, and is white, marked with black lines on the back; the central tail feathers are white. The Red-tailed Tropic-bird (*Phaethon phenicurus*), found in the Indian and Pacific Oceans, has the elongated tail feathers red.

**TROPICS**, the circles of the earth parallel to the equator, that is, the parallels of 23½° N. lat. and S. lat., which pass through the most widely separated places to which the sun is vertical at the solstices. The tropics are



thus the extreme boundaries of the torrid zone. The latitude of any spot upon either tropic is therefore the same as the obliquity of the ecliptic, and the interval between the northern and southern tropics comprehends every part of the earth at which the sun is ever vertical. The

northern is called the Tropic of Cancer, and the southern the Tropic of Capricorn, since the sun, when vertical at places in the first, is at the commencement of the astronomical sign of Cancer; and when vertical at places in the second, is at the commencement of Capricornus. The word tropics, meaning turning-places, is given to these circles because when the sun reaches either the southern or the northern one in the gradual oscillation of his path in the heavens, he seems to turn, and gradually afterwards to approach the other tropic by slight daily variations of the height to which he climbs the sky.

**TROPICAL YEAR**, the year of our ordinary calendars, which is measured with reference to the equinoxes or the tropics, and computed by observing the time the sun takes to reach again in his yearly revolution any given point of this natme. The tropical year contains 365 days 6 hours 38 minutes and 45 seconds; and therefore exceeds the ANOMALISTIC YEAR by 25 minutes, and the SIDEREAL YEAR by 20 minutes 21 seconds. See these articles.

**TROPINE**, an organic base obtained from atropine ( $C_{17}H_{23}NO_3$ ) by the action of an alkali. Atropic acid ( $C_{17}H_{21}O_2$ ) is produced at the same time. Tropine is strongly alkaline, and is soluble in water, alcohol, and ether; the formula is  $C_8H_{15}NO$ . It crystallizes in colourless scales, which melt at  $61.2^\circ C.$  ( $142^\circ$  Fahr.) It combines with acids, forming crystallizable salts. The formula of the hydrochlorate is  $C_8H_{15}NOHCl$ ; that of the chloroplatinate, which is obtained in large orange crystals, is  $2(C_8H_{15}NOHCl)PtCl_2$ . It does not dilate the pupil of the eye.

**TROSS'ACHS**, a pass at the east end of Loch Katrine, in the county of Perth, Scotland, celebrated for the magnificence of its scenery. The greatest height, north side, is Benan, 1800 feet; on the south, Benvenue, 2600 feet; and in the pass itself are many lofty, rocky, wooded heights. A small stream traverses it, carrying the overflow of Loch Katrine to Loch Aelray. Sir Walter Scott gives a most beautiful description of it in his "Lady of the Lake."

**TROUBADOURS** (Prov. *trobar*, from the Ital. *trovar*, and Fr. *trouver*, to find), a school of poets who flourished in the south of France, in Catalonia and Aragon, and in the north of Italy from the eleventh to the latter end of the thirteenth century, and wrote in the Provençal or Romance language, also called the *Langue d'oc*. They were warmly encouraged by the counts of Toulouse, Provence, and Barcelona, and began to decline in enthusiasm and diminish in numbers after the power of the former was broken by the crusade so remorselessly directed against the Albigenses. The troubadours, in the palmy days of Provençal poetry, were chiefly knights, who cultivated the art of song for their own pleasure or that of their patrons, and whose compositions were spread abroad by the agency of an inferior order of minstrels, called *jongleurs*. These compositions belonged almost entirely to lyric poetry, and their themes were either of an amatory, satirical, or bacchanalian character, though in stirring times they essayed more ambitious flights, and celebrated heroes and heroic deeds. They indulged in the most complicated metres and artificial rhymes, yet many of the poems which have descended to us are inspired by true poetic fire, and there can be little doubt that the troubadours did much towards inspiring European literature with its romantic, in contrast to its classical, tone. The principal varieties of composition were—*tenzones*, or rhythmic duets between two minstrels, reminding one of some of the elegiacs of Theokritos or Virgil; *serventes*, service songs, dedicated to the praise of their patron, or to martial and serious subjects; *chansons*, short songs of an amatory character; *cantos*, more ambitious love-songs; *planets*, lamentations on the cruelty, real or supposed, of a real or ideal mistress; *pastorals*, lays in celebration of rural

pleasures and a pastoral life; besides *redondes*, *aubades*, *screnades*, *lais*, *soudas*, and the like.

The troubadours were emphatically the poets of chivalry, and rose and fell with that peculiar institution. Their most liberal patrons were the principal chivalric leaders, the princes and barons most imbued with the true chivalric spirit; as Raimund and Alphonse, counts of Provence; Raimund de St. Gilles and Raimund IV., counts of Toulouse; Alfonso II., king of Aragon; Alfonso the Wise, king of Castile; Boniface, count of Montferrat; and Richard I. of England, himself a troubadour of no mean merit. The names and some of the productions of upwards of 200 troubadours have been preserved, but our limited space compels us to restrict our enumeration to the following:—Guillem IX., count of Poitiers (1087–1127); Bernard de Ventadour (1110–95), the son of a serf, warmly encouraged by Eleanor, queen of our Henry II.; Jaufre Rudel, prince of Blaya (1140–70), renowned for his wild devotion to the Countess of Tripoli, whom, however, he never saw till shortly before his death; Pierre Vidal (1175–1215), one of the truest poets of the fraternity, both in life and genius a kind of troubadour Byron; Bertrand de Born (1180–95), the antagonist, both with sword and pen, of Henry II., and who ended his days as a monk in Coteaux; Folquet de Marseille (1180–1231), afterwards bishop of Toulouse, and a violent persecutor of the Albigenses; the nameless monk of Montaudon (1180–1200), who was patronized by Alfonso II. of Aragon, and died prior of Villafranca; Arnaut Daniel (1180–1200), whose high honour it is to have been praised by Dante; Raimon de Miraval (1190–1220); and, last of the true troubadours, Guiraut Riquier (1250–91), who appears to have been liberally befriended by Alfonso V., king of Castile.

At Toulouse the "Capitols," or municipal magistrates, established an academy called *Del Gai Saber*, or "of the gay science;" and seven of the best rhymers of the place, styled "the Seven Troubadours of Toulouse," were placed at the head of it. They fixed upon the 1st of May for holding an annual public festival, to which they gave the name of "Floral Games." The first meeting was held in 1324, and was attended by many poets from various parts of Languedoc. [See CLIMENCI-SABRE.] The morality of troubadour poetry underwent a reform under this new institution. The pageant of the "Floral Games" continued to be celebrated till the French Revolution.

Much interesting information relative to the troubadours and their poetry is embodied in the ninth chapter of Hallam's "Literary History of the Middle Ages;" "The Troubadours, their Loves and their Lyrics," by J. Rutherford (London, 1873); and Sir G. Cornewall Lewis's "Researches into the Romance Languages." These are the most accessible for the general reader. The student may consult De Laveleye, "Histoire de la Langue et de la Littérature Provençale" (Brussels, 1845); Mahn, "Die Werke der Troubadours" (Berlin, 1816); Fauriel, "Histoire de la Littérature Provençale" (Paris, 1846); and Kannegger, "Gedichte der Troubadours" (Tubingen, 1852).

**TROUT** is the name given to some of the smaller species of fishes belonging to the genus *Salmo*, family SALMONIDÆ. This genus, as stated in the latter article, is divided into two sections, the first of which, *Salmones*, contains the Common SALMON (*Salmo salar*) and several nearly allied species, and also several species known as trout, which form the subject of the present article.

The Gray trout, Bull-trout, or Sewin (*Salmo cambricus*) is a thicker fish in proportion to its weight than the salmon: the bases of the fins and the tail are much more muscular; the head is also larger in proportion to its body, and the teeth are longer and stronger. The outline of the tail becomes convex in the adult fish, owing to the elongation of the central caudal rays. The operculum is square in outline, and relatively larger than in the salmon. The

scales are rather smaller and the colour less bright; the male in the spawning season is orange-brown, and the female blackish-gray. It attains a weight of from 6 to 20 lbs. It is migratory, like the salmon, ascending rivers to spawn. This fish is found abundantly in the Tweed and its tributaries, and also in some of the rivers of the Solway Frith, as well as in the rivers of South Wales, Dorsetshire, and Cornwall. It is also found on the northern shores of Ireland, and in Norway and Denmark. The young fish, when they weigh not more than 2 or 3 lbs., are called Whitlings. As food their flesh is less esteemed than many others of the salmon tribe, as it is coarse (which is quite in accordance with their strong muscular development), and is of a pale orange or yellow colour. In the markets they obtain only an inferior price. The fish known by the name of the Norway Salmon seems to be identical with this species. They take the bait freely, and when hooked, owing to their powerful muscular structure, make prodigious efforts to escape. It may be observed that the name Bull-trout is often given also to the two following species, as well as sometimes to small specimens of the common salmon.

The Salmon trout (*Salmo trutta*), like the preceding species and the common salmon, is migratory. Next to the salmon itself, the salmon-trout is most esteemed as an article of diet. It has a small head, a very broad back, a slightly forked tail; the flesh is a pink colour, and of a rich flavour. In colour it much resembles the salmon, but the body is darker and the fins lighter; the sides, chiefly above the lateral line, are marked with numerous cross-shaped dusky spots. The teeth are more numerous and more slender than in the salmon. It is a smaller fish than the gray-trout. It is specially abundant in the rivers of Scotland. This fish is the White-trout of Devonshire, Wales, and Ireland; the Sea-trout, Herling, and Whitting of the Solway; the Finnock of the north and west coasts of Scotland; and the Salmon trout of the London market. It is also widely distributed throughout the rivers and lakes of Europe. In their migratory habits, and the time and mode of depositing their spawn, they resemble very much the common salmon. The Fordwich-trout of Isaac Walton is the salmon-trout.

The Common or River Trout (*Salmo fario*) is an inhabitant of most of the lakes and rivers of Britain, and is perhaps, on account of its colours and form, the most lovely and beautiful of its class. The variations of its tints are almost infinite; yellow, however, is the predominating ground-colour, varying to an orange, and sometimes passing into a dark greenish-black or violet, which is covered over with black and red spots. The variations in colour in this and other species of trout is stated by Günther to depend chiefly on the character of the water in which the fish live. "Trout with intense ocellated spots are generally found in clear, rapid rivers, and in small open Alpine pools; in the large lakes with pebbly bottom the fish are bright silvery, and the ocellated spots are mixed with or replaced by cross-shaped black spots; in pools or parts of lakes with muddy or peaty bottom, the trout are of darker colour generally, and when inclosed in caves or holes, they may assume an almost uniform blackish colouration." On the other hand, according to the same authority, the variation in the colour of the flesh, from pink to white, is due chiefly to the food. The average weight of the trout is about a pound or a pound and a half; in large lakes or rivers they reach a larger size, specimens having been taken weighing as much as 15 lbs. A trout was once caught in a branch of the Avon at Salisbury which weighed 25 lbs. The food of the trout consists of small crustaceans and molluscs, flies, small fishes, and the fry of fishes. They feed towards evening. The trout spawns in October on gravelly beds in running streams, those inhabiting lakes ascending streams for this purpose.

The trout is one of the greatest prizes of the angler. The artificial fly is the best bait in fine weather, and the worm is employed in wet weather or when the streams are much swollen by rain.

The Gillaroo-trout of Lough Neagh and other lakes in the north of Ireland is considered by Günther to be a distinct species, *Salmo stomarchicus*. It attains a large size, specimens having been taken weighing 30 lbs.

The Great Lake Trout (*Salmo ferax*) was first noticed by Pennant as an inhabitant of Ulswater Lake in Cumberland, and Lough Neagh in Ireland. This fish attains an average weight of 25 pounds, but specimens have been seen weighing 50 or 60. It may be distinguished from the common trout by its great size, the large proportional size of the head, and the square extremity of the tail in all its stages of growth. This fish is almost entirely confined to lakes, seldom ascending or descending rivers, and it never migrates to the sea. It is found in most of the larger and deeper lakes in England, Scotland, and Ireland. In colour it is purplish-brown, passing into yellowish-green on the belly; the gill covers and body are marked with large spots, which are not numerous. It feeds almost entirely on small fishes, and is very rapacious. The flavour of this fish is indifferent when compared with the salmon and salmon-trout. These fish are generally caught on trolling lines baited with a small trout.

The Loch Leven Trout (*Salmo leuconensis*) is peculiar to Loch Leven, in Scotland. It is distinguished from the common trout by its great size, more pointed pectoral fins, longer and more forked tail, and the red tint of the flesh.

A few other species of trout are found in the British Isles. *Salmo brachyptoma* from the Forth, Tweed, and Unse, *Salmo gallivensis* from Galway, both migratory species; *Salmo arcadensis*, the lake trout of the Orkneys; and *Salmo nigripinnatus*, in mountain-pools of Wales. Other species are also found in the lakes and rivers of Europe and North America, the rivers of the Hindu Kush, and the Pacific coast of Asia.

**TROUVÈRES**, the early poets of the *Langue d'Oïl* of Northern France, as the troubadours were the poets of the *Langue d'Oc* of sunny Provence and the south. But the two classes of poets differ in their tone as widely as in their language. With the trouvère the situation or the story is the all-absorbing theme, with the troubadour it is the way in which it is told. The language is the means to the trouvère, the end to the troubadour. Excellent modern examples of the two kinds of minds are the trouvère spirit of Walter Scott, and the troubadour spirit of Victor Hugo. Lyrics and love songs are the staple of troubadour poetry; *chansons de gestes*, long ancient ballads of stirring incident, are the prime flower of the trouvères. These latter were knightly poets or priests, whose works, composed in various northern dialects, Norman, Picard, &c., were rarely performed by themselves, but rather by travelling minstrels called Jongleurs (and Jongleresses), to whom they had taught them, or lent them if they were written. Consequently, in very few cases do we know the names of the authors of these priceless old ballads of the twelfth and thirteenth centuries. They give us the history of the peers of Charles the Great: Roland, Oliver, Ogier the Dane; of Huon de Bourdeaux, the four sons of Aymon, Pierabras, and the like.

**TROUVILLE**, a favorite watering place of France, in the department of Calvados, 10 miles south-west of Houleur. It is prettily situated at the foot of a hill, near a forest, at the mouth of the Tonques in the English Channel. The sands and bathing are very good, and a pier and floating dock have increased its importance as a port. It has long been celebrated for oysters. The population in 1886 was 6308.

**TROVER** (Fr. *trouver*, to find) was formerly the name given to a special action on the case. It was applicable to

questions respecting the right to personal chattels only. It might be brought either by the owner, or by a bailee, as a carrier, or by a mere finder as against all except the owner. The declaration stated that the plaintiff was lawfully possessed, as of his own property, of certain personal chattels, naming them distinctly, their amount and value; that he afterwards casually lost them, and that they came into the possession of the defendant by *finding*, who afterwards converted them to his own use; for which the plaintiff claimed damages. This form and the fiction respecting the finding were contrived for the purpose, by assuming a right of possession in the defendant, of enabling the parties to try the bare question as to the right between the plaintiff and defendant to recover or retain the goods. In answer to this declaration the defendant might either plead not guilty, under which plea the only question raised was the mere fact of the actual conversion, or he might plead specially the circumstances under which, admitting the conversion, he claimed a right to detain the goods. The fact of the conversion was proved by showing that the defendant upon request distinctly refused to deliver up the goods, or had destroyed them, or had assumed the right to dispose of them. The action was not maintainable by one joint tenant, or tenant in common, or partner, against another, unless in the case where the chattel had been destroyed by the other. This rule was founded on the principle (of the English law), that the possession of one is, by reason of the joint property of all, held to be the possession of all, and therefore no act of conversion can be said to have been committed.

The other pleas which were an answer to this action were, a denial of the property of the plaintiff in the chattel; or the Statute of Limitations that six years had elapsed since the act of conversion was committed; or any circumstance showing that the defendant had a right to detain the goods, as for paying a lien upon them, &c.

The necessity for a fictitious allegation of the finding, however, was abolished by the Common Law Procedure Act of 1852, s. 10, and since then trover as a distinct form of action has ceased to exist.

*Trover* is the name of a suit is unknown in Scotland, but the remedy is in an action for recovery or delivery of movables, or for value or damages for deprivation of such.

**TROWBRIDGE**, a market town of England, in the county of Wilts, situated on the declivity of a rocky hill on the north-east bank of the Bisc, a tributary of the Bristol Avon, 25 miles north-west from Salisbury, and 97 miles W.S.W. of London by the Great Western Railway. It is a thriving and growing town, and the houses are chiefly of stone, and generally of good and substantial erection. The parish church is a spacious Perpendicular edifice, with a nave, chancel, two aisles with chapels attached to their eastern extremities, a north and a south porch, and a large western tower and spire. The poet Crabbe is buried here. There is a chapel of ease in the town, of Early English architecture, and another at Staverton, also in the parish, but about 2 miles south of Trowbridge. There are several dissenting places of worship; schools are numerous; and the town also contains a library and a good school for the poor. The principal branch of industry is the manufacture of broadcloth and hosiery. Trowbridge is the largest clothing town in the county. It is one of the most prosperous in the west of England. The Great Western Railway from Chippenham to Westbury runs through Trowbridge, and the Kennet and Avon Canal, at the distance of one mile to the north. The population in 1881 was 11,391.

**TROY** (*Gk. Τροία*) is the name both of the country in which the city of Troy was situated and of the city itself. The country, more commonly called *Troas* or the *Troad*, formed the north-west part of Mysia in Asia Minor. In

after ages this tract preserved its name, and under the Romans it formed a separate district of Mysia. It was bounded on the W. and N.W. by the *Ægean Sea* and the *Hellespont*, the extent of its coast being from the promontory of Lekton on the south to the river Rhodios, which falls into the Hellespont below Abydos, on the north. Its eastern boundary was a ridge of Mount Ida, extending from the source of the Rhodios to the sea-coast near the promontory of Lekton. Strabo gives a greater extent to the Troad by including as subjects of the King of Troy several states which were only his allies.

The inhabitants of the Troad were probably of Thracian origin. At the time of the Trojan War they had reached a higher state of prosperity and civilization than the Achæans, their assailants. There was no considerable town in the district except the capital.

The city of Troy, also called Ilium, was situated, according to the Homeric poems, at the foot of Mount Ida, far enough from the sea to allow of the movements of two large armies, and in a position which commanded a view of the plain before it, and of a smaller one behind it. In front of it were two rivers, the Simois and Skauandros, flowing parallel for some distance, which united and emptied into the Hellespont. This city, the existence of which is attested only by the traditions of the Trojan War, must be distinguished from the Ilium (*Lat. Ilium*) of history, which, according to Strabo, was founded about the beginning of the seventh century B.C. The former was afterward designated as Old Ilium, and the latter as New Ilium. The name was shared also by a third place in the same region, the *chorê Iliôn* (the village of the Ilians), about 3 miles from New Ilium, which claimed to occupy the site of the original Troy. According to the legend, Dardanos was the mythical ancestor of the Trojan kings, who were of the Teukrian race, closely connected with the Mysian. Dardanos's son was Erichthonios, who was succeeded by Ilos, and he by Ilos, who founded in the plain of Troy the city of Ilium. Ilos was succeeded by Laomedon, and to him Poseidon and Apollo became temporarily subject by command of Zeus. The former built the walls of the city, and the latter took care of the herds; but when their time of service expired, Laomedon treacherously refused to pay what was due them. In revenge Poseidon sent a sea monster to kill the Trojans and ravage their fields. Laomedon promised the immortal horses given by Jupiter to Troy to any one who could rid the land of the monster. An oracle declared that a virgin of noble blood must be given up, and the lot fell on Hesione, Laomedon's own daughter; but she was rescued by Herakles, who killed the monster. Laomedon gave the hero more mortal horses, and the latter, indignant at his perfidy, collected six ships, attacked and captured Troy, killed Laomedon, and placed on the throne Priam, who alone of Laomedon's sons had remonstrated against the perfidy of his father. Priam was born, by his wife Hekabê (*Lat. Hecuba*) and by concubines, a large number of daughters and fifty sons, one of whom, Paris, brought on by his abduction of Hekabê, wife of Menelaos, king of Sparta, the memorable siege of Troy. To revenge this outrage, the Greeks spent ten years in the collection of a vast armament, and at the end of that time a fleet of 1186 ships, containing more than 100,000 men, was assembled at Aulê, in Boeotia, and placed under the command of Agamemnon, brother of Menelaos. The Trojans and their allies were driven within the walls of their city, and nine years were spent by the Greek host in the reduction of the neighbouring district. But the gods now brought on the quarrel between Agamemnon and Achilles, which proved so disastrous to the Greeks, and with which the narrative of the siege in the Iliad opens. Among the principal Greek heroes in the struggle, besides Agamemnon, Menelaos, and Achilles, were Odysseus (Ulysses), Aias (Ajax), Diomedes, Patroklos, and Pala-

mêdês; and among the bravest defenders of Troy, Hektor, Sarpedôn, and Aineias (Æneas). The valor of Achilles (who slew Hektor, avenging the death of his friend Patroklos) and the cunning of Odusseus finally prevailed, with the aid of Hera, Athena, and other divinities hostile to the Trojans; and after a siege of ten years (generally placed at about 1194-84 B.C.) Troy was utterly destroyed, Aineias and Antenor almost alone escaping with their families. The opinions of the principal authorities on the question cannot agree that the siege of Troy was a historical event. It certainly shows a vast conflict at a very early date between the great Thracian Empire of North-west Asia Minor and the new-born Achaian powers in Greece, the latter being victorious, but unable to use their victory at the time, because of their own weakness, and especially their want of maritime power. Though it was the popular belief of antiquity that New Ilion had been built on the ruins of the Old, yet that town never rose to importance, and Dêmétrios of Skepsis and Hestâia of Alexandria maintained that the remains of Priam's Ilion were to be found rather in the "village of the Ilions," which opinion was supported also by Strabo. The ruins of New Ilion are near the village of Hissalik, on a small hill. The ancient historians Hellenikos, Xenophôn, and Arrian identified this hill as the citadel of Pergamos; and Xerxes, Alexander, and the Roman consuls and emperors, all offered hecatombs here to the gods of Ilion and the Trojan heroes.

In 1785 Le Chevalier discovered on the left bank of the Menderes, near the village of Bunarbashi, about 5 miles south of New Ilion, a hot and a cold spring or fountain, which he supposed to be those mentioned in the *Iliad*. His view was speedily adopted by the majority of Greek archaeologists and philologists, who until recently warmly defended it as the only possible means of harmonizing the Homeric text with the chorography and topography of the Troad. But the excavations made on the neighbouring Haladach, the hill thus supposed to be the site of Troy, brought to light only a few terra-cotta figures, lamps, pottery, and coins of no ancient date, without revealing the foundations of a town or city. In 1871-73 the German traveller Schliemann undertook to excavate at his own expense the hill of Hissalik. He dug to a depth of about 50 feet, and encountered several layers of ruins, each of which he considered to be the remains of a distinct city, one built on the ruins of the other. He unearthed a vast number of arms, household utensils, and ornaments of various degrees of workmanship and kinds of material. He produced a treasure of vases and various ornaments of gold, amber, and silver, which he thinks belonged to Priam, the Trojan king. He maintains that he had bare the palace of this king, the Skáion (Lat. *Scaion*) gates before it, the older walls of Poseidon and Apollo, the streets of the city, houses which must have been two or three storeys high, a ritual altar to Athena, and twenty fountains, besides inscriptions of various dates and in several languages and dialects. The hill he claims to have proved to be the Akropolis or central hill fortress of Ilion, the main parts of the great city extending on three sides into the plain. Some scholars dispute his reasonings, and consider that he has accidentally hit upon the site of some unknown Hittite settlement, Lydian town, or Phœnician trading post, but the great majority now admit that we have found Troy.

In 1882 Schliemann returned to the charge, and again excavated at Hissalik for five months, embodying his conclusions in "*Troja*" (London, 1882). The famous archaeologists Dürpfeld and Höfler accompanied Schliemann, and witnessed the unmistakable proofs that the second of the six prehistoric cities which lay on each other was destroyed by fire.

See Le Chevalier, "*Voyage de la Troade*" (three vols.,

third edition, Paris, 1802); Forchhammer, "*Beschreibung der Ebene von Troja*" (Frankfurt, 1850); Hahn, "*Die Ausgrabungen auf dem Homerischen Pergamos*" (Leipzig, 1865); and Schliemann, "*Ilion*," translated as "*Troy and its Remains*," edited by Dr. Philip Smith (1875).

**TROY**, a city of the United States, in the State of New York, standing on the Hudson, at the head of its tidal influence and steamboat navigation, 6 miles north of Albany, and 140 miles north by east of New York. The site is a plain, from which an eminence called Mount Ida rises in the rear of the city, and a rocky height, called Olympus, 200 feet in elevation. The town stretches 3 miles along the river, with a breadth inland of one mile. One street follows the windings of the river, lined with large warehouses; the others are at right angles to one another, and 60 feet wide, well paved, and planted with trees. It has extensive Bessemer steel works, and its iron-works are of great magnitude; there are also a large railway carriage factory, and a famous bell-foundry (at West Troy), besides manufactures of cotton and woollen goods, paper, carpets, leather, &c. It is famous for its educational establishments. It is connected by railway with New York, Boston, Buffalo, and Montreal, and is favourably situated for commerce in the transshipment and transit of goods. The population in 1880 was 56,747.

**TROY WEIGHT.** Neither the etymology nor the time of introduction of this denomination is well known; the received opinion is that it took its name from a weight used at the fair of Troyes.

The troy pound is the legal standard, though only actually used in weighing precious metals and stones and apothecaries' drugs. There is no doubt that it was originally the pound of silver, the pound sterling, and there is evidence that this pound was sometimes described as divided into twenty parts called sterling shillings. The famous statute of Henry I. (1200) takes a standard for it from the weight of ears of wheat—viz., 32 grains taken from the middle of the ear.

The pound troy is now divided, for gold and silver, into twelve ounces, each ounce into twenty pennyweights, and each pennyweight into twenty-four grains. But for medicines each ounce troy is divided into eight drams or drachms, each drachm into three scruples, and each scruple into twenty grains. A cubic foot of water weighs 75.7374 pounds troy, and a pound troy bulks 22.815676 cubic inches of distilled water at 62 Fahr., barometer 30 inches. From the troy pound the avoirdupois pound is derived, the latter containing 7000 grains, while the pound troy contains but 5760. The troy weight of 1621, measuring 1.321 of the true troy pound, is now abolished by law.

**TROYES**, the capital of the French department of Aube, is situated in the middle of a vast and fertile plain on the left bank of the Seine, which partly surrounds the town and supplies numerous emals that enter its interior, 87 miles by railway south-east from Paris. It has its civil and commercial tribunals, a college of commerce, a council of judicature, a society of agriculture, science, and art, a diocesan seminary, a college normal school, cabinet of natural history, and museum. The population in 1886 was 11,861. Trojes occupies the site of the chief town of the Celtic *Trois*, which was named by the Romans *Augusta Tronens*. On the decline of the Roman power, it was called *Lugdunus* or *Trecasse*, and later still *Troies*, from which the modern name has been derived. It was burnt by the Normans in 889, and in the feudal period was the capital of the important county of Champagne; was taken by the Duke of Burgundy in 1115; and here, in 1120, the marriage of Henry V. of England with Catharine of France was concluded, and the treaty arranged by which Henry was to succeed Charles VI. on the throne. Troyes was retaken from the English



by Joan of Arc in 1429. In 1814 it was the scene of severe combats between the French and Russians.

The Seine flows on the northern and eastern sides of the town, which is surrounded by old Roman ramparts planted with trees. The houses are many of them old, with gables towards the streets painted or plainer, frequently adorned with coarse carving, and with dark pent-houses, which overhang the shops. The Cathedral of St. Pierre, founded in 872, and rebuilt between the thirteenth and sixteenth centuries, is a fine specimen of Gothic architecture. The building has never been completed; there were to have been two western towers, but one only, about 205 feet high, has been erected. There are several other churches, and all are more or less rich in painted windows: those of St. Nizier and St. Pantaléon are in black and white; those of La Madeleine are equally beautiful for colouring and for design. The Hôtel-Dieu is a fine building of the last century; the town-hall has a handsome stone front, adorned with columns of black marble; the gate of St. Jacques, which is flanked by two towers and surmounted by a light spire, is sometimes ascribed to Caesar. Among the other buildings are the theatre, the episcopal palace, the wine-mart, the abattoirs, and the jail and house of correction. The public library, which is found in a great measure of the collections found in the suppressed monasteries, contains 110,000 volumes, besides 5000 MSS. The manufactures are millinery and sausages, a chalk preparation called *blanc d'Espagne* (Spanish white), cotton stockings, and caps.

An English standard measure (that still used by goldsmiths and jewellers) is said to be derived from the town, and bears its name. [See TROY WEIGHT.] Troyes gives title to a bishop, whose see is the department of Aube. It is the native place of Pope Urban IV.

**TROY NOVANT**, the mythical name of London in the "Brut," a romance metrical version, by Wace, of Geoffrey of Monmouth's legendary chronicle, completed in the earliest years of Henry II.'s reign (1155). So famous were these legends that Geoffrey was made bishop of St. Asaph, and Wace prebendary of Bayeux.

The aim of these chronicles, whose work was avowedly as imaginary as it not more imaginary than the *Æneid* itself, was to trace the unbroken descent of King Arthur from Brutus, great-grandson of Æneas, prince of Troy. Brutus, or Brut, was driven from Italy by domestic misfortunes, and with a company of adventurers discovered Albion, conquered it, renamed it Britain after himself, and founded New Troy (Troynovant) in the place afterwards known as London. The name was said to be preserved in the famous tribe or kingdom of the Trinobantes, known to us through Roman accounts. Probably, however, the direct contrary was the case, and the name of the Trinobantes was responsible for the mythical Troynovant.

**TRUCE OF GOD** (Lat. *treuga Dei* or *trewa Dei*, from Ger. *treue*, faith), an institution of the middle ages, designed to mitigate the violation of private war by prohibiting hostilities from Thursday evening to Sunday evening of each week, also during the entire season of Advent and Lent, and on certain festival days. The days of the week selected were supposed to be rendered holy by the death and resurrection of Christ. It was introduced after the great famine of 1028-30, by the bishops of Aquitaine, who proclaimed a universal peace; as it was found impossible to enforce this, they were obliged to limit it to certain days, and thus arose the "truce of God" in its peculiar sense. The regulation soon spread over all France. In 1041 the Aquitanian bishops ordered that no private feuds should be prosecuted from sunset on Wednesday to sunrise on Monday following. This was extended by the Council of Clermont to the time from Advent to Epiphany, from Lent to eight days after Pentecost (Whitsuntide), and afterwards to the feasts of the Virgin, of John the Baptist, of the

apostles Peter and Paul, and of All Saints, and the eves of those days. Calixtus II., at the Council of Rheims in 1119, renewed the "truce of God," commanding war to cease on the above-mentioned times throughout Christendom; all violators were to be excommunicated, and, unless satisfaction were given either by themselves or by their children, were to be denied a Christian burial. When the states of Europe began to assume a more consolidated form, and violations of peace and order came under the control of the civil authority, the "truce of God" disappeared.

**TRUCK SYSTEM; TRUCK ACT.** The term truck, which means exchange or barter, is now used to signify the payment of wages of labour in goods, and not in money. By the truck system is meant this mode of paying wages, together with all its tendencies and results. The Truck Act, 1 & 2 Will. IV. c. 36, 37, passed in 1831, which, repealing all the previous Acts passed for the same purpose, made stricter provisions for the prevention of payment of wages in truck in the departments of industry therein enumerated. The wages of agricultural labourers and domestic servants were exempted from the operation of the Act. The evidence published in the Report of the Select Committee of the House of Commons appointed in the session of 1842, "to inquire into the operation of the law which prohibits the payment of wages in goods, or otherwise than in the current coin of the realm, and into the alleged violations and defects of the existing enactments," showed that, notwithstanding the Truck Act, the truck system was still in extensive operation in mills, factories, iron-works, collieries, and stone quarries in the kingdom, and abundantly illustrated the evil tendencies of the system.

The chief part of the evil of what is called the truck system is incidental, and not essential to the payment of wages in truck, and arises out of the power of the master over the workman, which enables the master to use this mode of paying wages to defraud and oppress the workman. A master may pay the wages of his workmen wholly or in part in truck, in articles of food, clothing, &c., either by agreement, or with only the understood consent of his workmen; and if he supply these articles at prices no higher than those at which they are to be procured elsewhere, and study to meet the various wants of the workmen and their families, the utmost harm that can result is the loss to the workmen of the moral and economical lessons which the disbursement by themselves of weekly money wages is fitted to supply, and the interference with the business and profits of neighbouring retail shopkeepers, and there will always in such cases be some advantage to set against these, so far as they go, evil results. Where the truck system acts beneficially, it is owing entirely to the justice and benevolence of the individual truck masters. On the character of the master everything depends. In the hands of masters of opposite character, and under circumstances which place the workman more or less at the mercy of his employer, the payment of wages in truck continually has been, and is still occasionally, used for the defrauding and oppressing of workmen. The iniquitous extortion practised under the system was exposed in the House of Commons in 1872, when some steps were taken to remedy the existing abuses, but although the evil was greatly abated, it did not wholly disappear, and in 1887 another Act was passed, under which the Act of 1831 was amended and extended. In an action brought by a workman for the recovery of his wages the employer is not entitled to any set-off or counter claim on account of goods supplied to the workman, nor can a workman be sued for any goods supplied to him by his employer. The employer can legally impose as a condition, express or implied, in the employment of any workman any terms as to the manner or place at which any wages paid to the workman are to be expended. Where deductions are made from



the wages of workmen for the education of children or in respect of medicine, medical attendance, or tools, the employer must, at least once every year, prepare a correct account of such payments for audit by auditors appointed by the workmen. It is the duty of inspectors of factories and inspectors of mines in their respective districts to enforce the provisions of the Act. Nothing in the enactment renders illegal a contract with a servant in husbandry for giving him food, drink (not being intoxicating), a cottage, or other allowances or privileges, in addition to money-wages, as remuneration for his services.

**TRUE**, in astronomy. This word is used in a somewhat technical sense. The place which a star or planet appears to occupy in the heavens is not called its true place, but that which it would occupy if the effects of refraction, parallax, &c., were removed, that is, if the spectator saw from the centre of the earth, and without the light passing through any refracting medium.

**TRUFFLE** (Tuber) is a genus of Fungi belonging to the group *TUBERACEÆ*, furnishing the most highly esteemed of edible Fungi. The truffles of commerce belong to several species, the best known of which are *Tuber cibarium*, *Tuber aestivum*, and *Tuber moschatum*. The truffle is the fructification of an ascomycetous fungus. It is entirely subterranean, somewhat globular in shape, varying in size from that of a filbert to that of a large duck's egg. The surface is generally black and warty. Truffles are found in most of the temperate parts of the world, and are tolerably abundant in Central and Southern Europe; in England they are found chiefly in the southern counties, especially on the Wiltshire and Hampshire Downs. They are found in loose calcareous soil at a depth varying from 2 or 3 inches to 2 feet, especially in the neighbourhood of trees.

Truffles have of late years become an essential to the gourmet; and as in the case of other much-prized articles of food, such as oysters and lobsters, scientific men have turned their attention to the cultivation of this delicacy. It has been observed that in the south of Europe the truffle grows best among the roots of the oak tree, which is now cultivated in large districts, not only for its value as timber, but also for this species of Fungus. Beneath this tree it acquires a perfume which is wanting when it vegetates in the roots of the hornbeam, beech, walnut, chestnut, or lilac, under all of which it is occasionally found. Pigs have a remarkable instinct for the discovery of the tuber. They invariably go direct to the trees, open deep furrows in the soil with their snouts, and if not carefully watched and prevented would greedily devour the dainty. In some parts of France pigs are regularly trained for the work, and rarely attempt to eat the prize. In this country dogs are generally employed for the same purpose, no particular breed being used. Large tracts of land in the south of France are now laid out in oak plantations, chiefly with a view to the production of truffles. Some of the trufflerwood cover more than 500 acres; and the cultivation has proved an important means of utilizing sterile land where even thyme will not grow. A good crop of truffles is secured some eight or ten years after sowing the oaks, and this will increase for from twenty to thirty years. At the end of this time the soil, overshadowed and impervious to rain, becomes no longer favourable for the growth of the subterranean fungus. This may be remedied to some extent by thinning the trees; but even when the yield of truffles has declined and ceased, the district derives a benefit from the improved climate and the supply of wood.

Truffles were prized as delicacies by the ancient Greeks and Romans. The best kinds have an aromatic flavour. The most esteemed are those of Périgord in France, where they form an ingredient in the celebrated Périgord pies, and those of Piedmont. Large quantities are exported from France, chiefly to this country; the value of the exports annually amounting to about 14,000,000 francs.

**TRUJILLO** or **TRUXILLO**, a decayed town of Venezuela, in a mountainous valley, 150 miles south-east of Maracaybo. It is said to have been one of the finest and most opulent cities of this part of America, previous to its being pillaged by the buccaneer Granmont, in 1678, when most of its inhabitants fled to Merida. The valley in which the city is built is so narrow as to admit nowhere of more than two parallel streets. Population, 2500.

**TRUMPET** (Ital. *tromba*, plural *trombe*), the noblest instrument of the horn kind. "The trumpet's loud clangour" is among the most exciting of musical tones, and its softer accents are silver-sweet. Handel, its greatest master, has written several duets for voice and trumpet, of which the finest is "Let the bright seraphim," and such is the beauty of the trumpet tone in the hands of a competent artist that it is sometimes difficult when this favourite piece is performed at a Handel festival at the Crystal Palace to be quite sure which is the voice part and which the trumpet part. Such tones are only producible on the orchestral trumpet or on the slide trumpet, where the tube of the instrument is so coiled that a crook is formed which can be made to slide in and out, and thus lengthen and shorten the tube as desired. Ventil trumpets perform the same operation by interior valves, but the tone loses all its finest charm and degenerates towards that of the cornet. The compass of a trumpet in C is as follows:—



The fundamental tone and its octave (notes 1 and 2) are not used. The note 7 is too flat for the *b♭* of the scale, and the note 11 is too sharp for the *f*''; while the four last notes are exceedingly risky and difficult to take. The slide trumpet can of course take the notes 7 and 11 truly by a slight momentary alteration in the length of the tube when those notes occur, and the whole series of notes given for C is reproduced in exact correspondence for every position of the slide. The shades of pitch producible on a slide trumpet are therefore infinite.

The usual orchestral trumpet does not slide, but is a tube of fixed length. Therefore, to prevent the trumpet from being limited to one key several crooks are used, which are coils of tubes of various lengths insertible into the body of the instrument. The music for the trumpet is written in the key of C, and the performer is directed at the beginning of the piece what crook to use, that is, what key to play in. If "trombe in D" is written, the D crook is used, and the player, who always plays in C, as far as fingering, blowing, &c., are concerned, produces in this case the corresponding sounds in the key of D. Variations in the pressure of the lip and in the force of blowing give the various harmonics of the series; and as these variations are but slight, while the least mistake is heard above the whole orchestra, it follows that the trumpet requires very careful playing. The best trumpeters are always Englishmen, and are never at any time very numerous.

The chief crooks in use for the trumpet are those of F (transposing a major Fourth higher), E♭, D, and C, the latter producing the notes as written. There are also those in B♭ (transposing a whole tone lower) and A. The crooks chosen are not always those of the key of the piece, but are those which give the notes most required. And as the lower crooks do not give so fine a tone the higher are preferred. For instance, for the key of A the composer would probably select a D trumpet. In Mendelssohn's

concerto in G minor, he has "trombe in D," for there is no G crook, and D is the nearest key.

The brilliant high passages so frequent in Bach, and fairly numerous in Handel, are now not playable because of the enlargement of modern mouthpieces. If a performer were to use one of the old narrow mouthpieces and practise up the high notes he would be unable to produce the lower tones and the full resonant quality which we now prefer.

The term "trumpet" in the Bible is made to cover three very different instruments. The "trumpet" of Numbers x. 2 was the *chatzotzerah*, a straight trumpet, about 2 feet long, often of silver, and very shrill. The trumpet of the Jericho legend, or of Sinai—the "holy trumpet," in fact—should rather be called a horn, being made of a curved ram's horn. This is the *shofar*, blown at the New Year to this day in every Jewish synagogue according to the command of Moses (Num. xxix. 1; Josh. vi. 5). To us, accustomed to the magnificent tone of the modern trumpet, and exalted by the fervour of the Bible language, the tone of the little *shofar* is almost ridiculously inadequate to the great occasions upon which it has been used. The third "trumpet" is also a horn, more nearly straight than the *shofar*; its name being the *keren*. It is believed to be the most ancient of the three; and probably is of Chaldean origin, as its name etymologically indicates.

**TRUMPET FISH** (*Centriscus*) is a genus of fishes belonging to the family Centriscidae, order ACANTHOPTERYGII. The trumpet fishes resemble the FLUTEMOUTH (Istiblennidae) in having the snout produced into a long tube, which terminates in a narrow toothless mouth. The body is of long or elevated, compressed, covered with small spiny scales on the sides and abdomen are several bony plates. There are two dorsal fins placed far back, the spinous dorsal being short; the ventral fins are abdominal in position, small, and composed of five soft rays. The *Centriscus* Trumpet Fish (*Centriscus scolopax*) occurs occasionally on the British coast, and is not uncommon in the Mediterranean. The greatly elongated form of the snout, by which the jaw bones are developed into a tube, in some cases nearly 2 inches in front of the eyes, has obtained for this ancient the names trumpet fish, snipe fish, sea snipe, and bellows fish. The colour of the back is red, the sides rather lighter; the sides of the head and belly are silvery, tinged with golden; the scales on the body are hard, rough, minutely ciliated at the free edge. It reaches a length of about 5 inches. The trumpet fish spawns in spring. It prefers a muddy bottom, in moderately deep water. Its food consists of minute crustaceans. The beak-like mouth is also well adapted for detaching minute animals from among the various sorts of seaweed. The flesh of the trumpet fish is considered good, and is often seen in the markets in Italy.

**TRUMPET FLOWER** is the popular name of some handsome flowering shrubs of the genera *Ligustrum*, *Tecoma*, *Stenolobium*, *Catalpa*, and other genera of the order BRONCHIALES, relating to the long tubular corollas of the flowers.

**TRUMPET WEED** is the name of a seaweed, *Dictyota baccinialis*, belonging to the group Phaeosporae, which abounds at the Cape of Good Hope. It has a stem 20 feet in length, crowned at the top by a fan-shaped cluster of fronds, about 19 to 12 feet long. The stem, which is below above, is dried, and used as a siphon, or by the native herdsmen as a trumpet to collect the cattle in the morning.

**TRUMPETER CRANE.** See *AGAMI*.

**TRUMPETS, FEAST OF**, a feast among the Jews which was held on the first and second days of the month Tishri, which was the commencement of the Jewish civil year. It derived its name from the blowing of trumpets in the Temple with more than usual solemnity, and it was marked by the offering in sacrifice of a young bullock, a

ram, and seven lambs of the first year, with a kid and the accustomed meat offerings in addition to the ordinary sacrifices of the day. The origin and significance of the feast are unknown, and various meanings are assigned to it by Jewish and Christian writers.

**TRURO**, a municipal and episcopal city and port of England, in the county of Cornwall, situated on the Allen and Kenwyn, two streams which unite to form a river a furlong wide, called Truro River, which flows into Falmouth Harbour. The town is generally regarded as the capital of the county, although Bodmin is the county town. It is 8 miles N.N.E. of Falmouth, and 300 miles from London by the Great Western Railway; is situated in a hollow surrounded by hills, and occupies the point of land between the Allen and Kenwyn, and portions of the opposite banks. In 1864 the Bishop of Exeter executed a deed of gift of his valuable and extensive ecclesiastical library to Cornwall, and a suitable building for its reception was erected in this town. Truro was made the seat of a bishopric and constituted a city in 1877, and a new cathedral—the first Protestant cathedral erected in England—was opened and consecrated on 3rd November, 1887. There are several other churches, a chapel of ease, and places of worship for the Roman Catholics, Independents, Baptists, Wesleyan and United Methodists (Free Church), Methodist New Connection, and Society of Friends. The town also has a good grammar-school, custom-house, county infirmary, and literary and scientific institutions. The trade of Truro is considerable, and it is the centre of an important mining district. Tin is smelted, and tin and copper are exported. The municipal borough is divided into two wards, and is governed by six aldermen and eighteen councillors. The parliamentary representation was merged into that of the county division in 1885. The population in 1881 was 10,619.

Truro is probably one of the oldest towns in the kingdom, originating out of the trade with the Phœnicians and Carthaginians, who came hither for the produce of the celebrated mines, and is the seat of the stannary and other courts connected with the duchy of Cornwall. The town derives its name from the old British words signifying "castle on the river." After the Conquest, the earls of Cornwall derived large revenues from the mines, especially Richard, brother of Henry III. Edmund, his brother, granted a charter to the miners, according to their certain privileges and immunities, and framing the stannary laws in exchange for which a royalty was put upon all the tin and copper extracted from the earth, payable to the earls of Cornwall, which laws were enlarged and a warden appointed for judicial purposes by Edward III. Prince Arthur, son of Henry VII., made certain regulations relating to the stannaries, which the miners refused to obey; and the king, after his son's death, took the stannaries into his own hands, but finding that under his management they were not so profitable as heretofore, he gave them up on payment of £1000 forfeiture by the miners, granting them at the same time a charter of pardon, and the privilege that for the future no law relating to "the miners" should be made or altered without the consent of twenty-four "stannators," to be chosen by the mayor and council, six from each of the four stannary towns. The government of the duchy is now vested in the Prince of Wales as duke, who has his chancellor, attorney general, solicitor-general, and court of exchequer, and who appoints the sheriffs. The mining trade is under the jurisdiction of the Court of Stannaries, at the head of which are the lord-warden and the vice-warden, who hold a court here quarterly, in the months of February, May, August, and November. The miners claim freedom from all other jurisdiction, excepting in cases affecting land, life, or limb, and the right of appeal to the duke. The duke and his

council formerly had power to alter the laws, subject to the consent of the "stannary parliament" now abolished. Among the worthies of Truro may be cited Samuel Foote, the playwright and wit; the first Lord Vivian; Henry Martyn, the Oriental missionary and scholar; Henry Bone, R.A., the porcelain decorator and miniature painter; and the African explorers, the brothers Lander, to the memory of one of whom, Richard, a Doric column, surmounted by his statue, has been erected.

**TRUSS.** (1) a recognized measure, a bundle of hay or straw; (2) a sort of brace to tie timber together; (3) a surgical appliance to support a hernia. These three meanings all repose upon one idea, however, that of fastening things together, as by twisting hay-bands, from the Old French *trousser*, to pack up, derived from the Latin *torquere, torseri*, to twist.

1. *Measure.* A truss of straw is 36 lbs., one of old hay is half a hundredweight, and one of new hay 60 lbs., and thirty-six trusses make a load.

2. *Constructive Brace.* The rods or bars which are added to a girder for the purpose of trussing or supporting it may be applied in two sets, one on each side of the girder, and connected together by short cross pieces at the necessary points, or the beam or girder itself may be divided longitudinally into two halves or flitches, separated just so far as to admit a single truss between them, and held in the right position by the insertion of small blocks. One of the simplest methods of trussing girders is that in which the beam rests upon walls at its extremities, and has two inclined struts, resting on notches in the timber at the lower end, and supported at the centre or junction by a vertical kingpost, screwed by a nut beneath the beam. This form is improved by connecting the lower ends of the inclined bars by an iron rod stretching in a perfectly straight line, and capable of being brought to any required degree of tension by means of screws or keys.

Cast-iron beams are frequently trussed with wrought-iron rods in a similar manner to those of wood, and applied to purposes for which great strength is required. The bridge which supports the London and Blackwall Railway across the street called the Minories is a familiar example. It has a clear span of 63 feet, and is supported by six massive trussed beams weighing about 15 tons each.

In shipbuilding trussing refers to diagonal timbers or iron plates crossing the ribs internally, and consolidating the whole together. Iron is preferred to wood, as being less heavy and not so bulky.

3. *Surgical Appliance.*—A mechanical contrivance used in surgery for the support of the parts concerned in abdominal rupture or hernia. It consists essentially of a pad attached to a metal spring, having straps so arranged that it may be kept in the desired position in any of the various movements of the body. The common form of truss consists of a steel spring covered with soft leather, lined with rubber or oiled silk, and having its ends approximating to within a few inches of each other; attached to one end is a small round or oval pad, stuffed with cotton or wool, and having for its basis a small iron plate; the other end of the spring has either a larger and flat pad, or a strap connected with it. The smaller pad is placed over the ring or point where the hernial tumour has protruded, and the spring passes over the hip, and either exerts its pressure by means of the large counter pad on the back, or is by means of a strap passing over the opposite hip connected with the pad by a buckle or eyelet and button on the back of the pad. Sometimes, where it is necessary to adjust it with great care, another strap passing over the inner surface of the thigh connects with the spring on the back. When, as is sometimes the case, there is a double hernia, this spring is made sufficiently long to clasp over

both hips, and has a pad at each end. In this case there should be a pad attached to the spring to exert gentle pressure on the spine, and thus keep the truss more perfectly in position.

Many varieties of the truss have been invented, among the best known forms being Coles's, which has a spiral spring acting on the pad; the Moc-Main Lever Truss, which dispenses with the usual circular spring and effects its pressure by means of a strap passing under the thigh and acting on a spring lever attached to the pad; Salmon and Odly's Self-adjusting Truss, which has a pad revolving on a ball and socket; and Wood's, which exerts a flat and level pressure at the sides of the hernial opening instead of the axis. In the choice of an instrument a surgeon should always be consulted, as an ill fitting and unsuitable truss may increase the mischief it is designed to alleviate. The part of the skin upon which the pad presses should be regularly washed and bathed with Eau de Cologne or spirit, or dusted with violet powder or Fuller's earth, and in the case of children it is a good plan to cover the truss with a linen cover, which can be changed when soiled.

**TRUST and TRUSTEE.** In English law a trust is a confidence reposed by one person, the trustor, either expressly or impliedly in another, called the trustee, for the benefit of the trustor, or of a third person, called by a barbarous Norman-French phrase, the *cestui que trust*, or C.Q.T. (pronounced *stitley trust*, in violation of every rule of pronunciation). As the trustee has all the title which a court of law can recognize he is said to have the legal estate; and as the *cestui que trust* has an interest which can be recognized by equity only, he is said to have an equitable estate. Formerly this distinction was one of great importance, but now equitable rights are recognized and enforced in all the courts, although the Chancery Division of the High Court still has assigned to it the execution of trusts charitable or private. There may be any number of trustees and any number of *cestui que trusts* in any trust, and as a general rule any person may be a trustee, even though he is incapacitated by law from transacting business on his own account. Thus infants, lunatics, married women, or other persons *non sui juris* may become trustees. The reason is, that the trust is created for the benefit of the *cestui que trust* and not of the trustee; and if the trustee cannot take the legal estate there will be nothing to support the equitable estate, and the trust will fail. So, too, it is an established doctrine that where a trust exists it can never fail on account of the death of a trustee or his refusal to accept the trust. All difficulties of this kind are avoided by the power of the proper court to remove a trustee and supply his place, or fill the place of a trustee when vacant by his death or refusal. A trustee is always at liberty to decline a trust, but if he once accepts he is not at liberty afterwards to renounce, unless the trust-deed contain a provision enabling him to do so, or he obtains his discharge from a proper court. The best and usually the only evidence of an acceptance of the trust is some action by the trustee under it. The same person may stand in different relations, thus he may be appointed executor and trustee, and in some cases it is difficult to say where the duty and responsibility of executor end and those of trustee begin. Trustees can only act jointly, and each of the trustees who are jointly implicated in a breach of trust is responsible for the entire loss, and liable to make it good, and the *cestui que trust* may, in case of need, proceed against any or all of them singly. Where a trustee holds the property for the benefit of the *cestui que trust* without any particular restrictions, directions, or provisions, it is called a *simple trust*, and then the nature and operation of the trust are determined by legal or equitable construction. But if the purposes of the trust, and the manner in which, and the means by which, these purposes shall be accomplished are specially pointed

out and defined, it is then a *special* trust, and these special directions must be accurately complied with. Hence a trust may be merely ministerial, and it is so called when the trustee has no other duty than to collect and pay over the proceeds of property. Or it may be a discretionary trust, and is so when the general purpose only is declared, and the manner in which this purpose shall be accomplished is left to the discretion of the trustee. There are also private trustees and public trustees. The former hold property for one or more individuals, who are distinctly pointed out, personally or by description. Public trustees are those who hold property for the benefit of the whole public, or for a certain large part of it, as a county, town, or parish. They are regarded by the law as in many respects official persons, with official rights and responsibilities. By English law trustees are held to a somewhat strict accountability. A trustee is bound not only to guard against loss or damage to the trust property, but to see that it is made reasonably productive. If he suffers it to lie idle unreasonably, when safe investments can be made, he will be charged with interest, and in some cases, as when he is guilty of gross delinquency, or if he mingles the property with his own for his own benefit in trade or otherwise, he will be charged with compound interest. A trustee is not entitled to lend the money of his trust on personal security or invest in the shares of any private company, but he may invest in mortgages (unless specially forbidden in the deed), in government funds, and in certain other securities of a safe character. He may not himself buy property which he has to sell as trustee, nor sell his own property and buy it as trustee. It is a standing rule that a trustee is not allowed to make a gain of his office, but trustees may make a fair contract with their *cestui que trust* to receive some compensation for acting, or to make professional charges. And though a trustee will not, in the absence of a contract, be allowed any remuneration for his trouble, he may in special cases employ agents, whose expenses will be allowed out of the estate, and he is entitled to claim expenses out of pocket whether provided by the deed or not, also travelling expenses, fees to court, costs of law-suits, &c. The Trustee Relief Acts, 19 & 11 Vict. c. 96 and 12 & 13 Vict. c. 74, were passed for the purpose of relieving trustees of the difficulty that sometimes arises as to whom the trust property really belongs. They can now, by paying the trust money into court, on petition obtain the directions of the Court of Appeal (Supreme Court). By the Conveyancing Acts, 1881 and 1882, 41 & 45 Vict. c. 41, ss. 31-38, 45 & 46 Vict. c. 39, s. 5, also, considerable powers and facilities are given for the appointment of new trustees and for vesting the trust property and conferring other powers on such new and continuing trustees.

In Scotch law there are several technical points of difference from the law of England, but the practical differences are not of great importance. The law there is to trusts, privileges, and rights of trustees is partly common law and partly statutory—the principal statutes being 1696, c. 25; 21 & 25 Vict. c. 84 (1861); 26 & 27 Vict. c. 115 (1863); 30 & 31 Vict. c. 27 (1867); and 47 & 48 Vict. c. 63 (1884).

**TRUTHS, NECESSARY.** See the article *IDEA*, section *Innate Ideas*.

**TRYPOGRAPH**, a sort of copying apparatus (Gr. *trapein*, a hole) whose principle of action is as follows:—The drawing or writing is done with a metal pencil on specially prepared stencil paper, which lies on a ridged plate like a magnified file-surface of very fine grain; therefore, as the pencil passes over the paper, writing rather heavily, numbers of minute holes are made in the stencil-paper. Such a stencil can be printed through with an ordinary inked roller, giving any number of impressions, on to ordinary paper beneath.

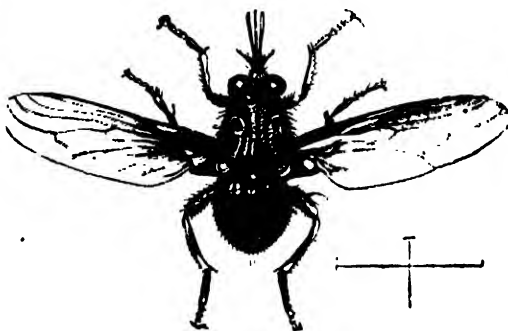
It differs from the modification called the *stylograph* only in the fact that the latter uses a perforating wheel, the stencil-paper lying on a smooth metal plate, whereas in the original tryptograph the pencil is smooth and the plate gives the perforations. The stylograph is usually considered the better form; both, however, are very successful and simple.

**TSAING** or **TSHAIN.** See **TSHAING**.

**TSANG.** See **TCHU**.

**TSAR** or **TZAR**, the correct spelling of the title of the Autocrat of all the Russias, which is generally corrupted into Czar, as if with some relation to Caesar. The word has, however, no such connection, and is simply a Tartar word for khan or petty ruler.

**TSE-TSE** (*Glossina morsitans*) is a destructive species of fly discovered by the African explorer, Dr. Livingstone. It belongs to the same family, Muscidae, of the order DIPTERA, as the common house-fly (*Musca domestica*), which it resembles in size and in appearance, but is a little longer and of a blacker colour, with transverse yellow bars



Tse-tse (*Glossina morsitans*).

on the abdomen. In the districts of Central Africa, where it occurs, it is peculiarly fatal both to horses and oxen. Wild animals escape its attack. The tse-tse is fortunately confined to particular districts, and can thus, to some extent, be guarded against. "The bite," says Dr. Livingstone, "of this poisonous insect is certain death to the ox, horse, or dog. The mule, ass, and goat enjoy the same immunity from the tse-tse as man and the camel. Many large tribes on the Zambesi can keep no domestic animals except the goat, in consequence of the scourge existing in their country." The buzz of this fly is described by Livingstone as being so peculiar, that when once heard it can never be forgotten.

**TSE-TSE** or **TZE-TZE**, a musical instrument of Eastern Africa, used in Abyssinia, Zanzibar, and among the Somali tribes, consisting of a carved stick for neck, a gourd for body, and a single string made of the palm tree-fibre. A closely similar instrument is used in Madagascar, and is there called the *horraon*. The carved notches on the stick serve as rude frets, and the instrument forms a very rude species of guitar.

The instrument gets its name from a fancied resemblance to the terrible fly of the East African deserts whose bite is so fatal to cattle.

**TSHAING** or **PAT-TSHAING**, a Burmese musical instrument, called also *tchain*, *tsaing*, &c. It consists of a number of drums, usually not less than sixteen nor more than twenty-one, hung in holes in a circular horizontal shelf supported on a frame, the performer sitting in the middle, armed with his drumsticks, or striking the drums with his knuckles or fingers, as with players on the tambourine. The smallest drum is about 2½, and the largest about 10 inches in diameter.

**TU'AM**, an ancient city and market-town of Ireland, in Galway, 15 miles from Athenry by a branch of the Midland Great Western Railway, is situated on both sides of the Harrow, an affluent of the Clare, which flows by Lough Corrib into Galway Bay. Tuam has been much improved of late years, but many parts of the town and suburbs are still in a very bad condition. The Protestant cathedral is an ancient edifice, a portion of a larger building, and was restored in 1878. Tuam is also the see of a Roman Catholic archbishop, and the cathedral is one of the finest modern ecclesiastical structures in Ireland. The College of St. Jarlath, for the education of priests, is under the care of the Roman Catholic archbishop of Tuam. The town contains barracks, assembly-rooms, a sessions-house, a dispensary, a fever-hospital, and a union workhouse. It is a great thoroughfare, has a very good retail trade, and affords a market for a large quantity of agricultural produce. There are manufactures of linen and canvas in the town. The population in 1881 was 3567; of the parish, 7845.

**TU'BA**, the long, straight, metal military trumpet of the Romans. In modern music the term is used for a very powerful bass instrument of brass, which has recently superseded the ophicleide because of its superior blending quality. It has a compass from FF to f", and its music



is written as played, for it is not a "transposing" instrument. Wagner is its greatest master, and his finest effects are found in the "Walküre," where he has introduced slow notes of the tuba at the very low pitch of EE♭, a whole tone below the usual extreme. To obtain these exceptional notes plenty of time must be given for the proper emission of the tone. The tone of the powerful tuba is imitated on the organ in a stop of the same name, a very sonorous reed stop of majestic effect in the large registers.

**TU'BER.** See STERN.

**TUBERA' CEA** is a group of Fungi, belonging to the order ASCOMYCETES. The fructification is a subterranean tuberous perithecium, with a thick wall inclosing a denseness of hyphae, among which are the asci, containing the spores. The mycelium is usually very small. This group contains the TRUFFLES (Tuber, &c.), and PENICILLIUM (Blue Mould); in the case of the latter alone is any process of sexual reproduction known.

**TUBER' CULO' SIS** is the name given to a very widespread constitutional disease, of a hereditary character, apparently induced by unfavourable physical surroundings in the first instance, but which may be received by inheritance or infection apart from these. Tuberculosis is characterized by the presence of "tubercles" in the body, but the exact nature of these morbid products is as yet somewhat uncertain. In the general way they appear in the form of small translucent, or more often, opaque particles, when solid, of a dirty white colour and "cheesy" consistence, which are found pervading different parts of the body, more especially the lungs, the intestines and their glands, and the brain. Where persons are born with a tendency towards tuberculosis, any persistent irritation may induce an onset of the disease, which may, according to circumstances, attack the head, bringing on what is known as tubercular meningitis; the bowels, inducing ulceration, inflammation, persistent diarrhoea, and in some cases peritonitis; or the lungs, in which case the disease is known as consumption. Other forms of this disease are known as tubercular pleurisy and pericarditis; tubercular disease of the fauces, of the larynx, of the kidneys, of the genito-urinary passages, of the lymphatic glands, of the skin, and of other parts of the body. Some of these dis-

eases are mentioned under their appropriate headings, and any discussion of the remainder would be necessarily of too technical a nature to be in keeping with a work of this character. It may, however, be noted that where persons know they inherit a tendency to this disease, they should either avoid marriage, or should specially guard against choosing partners subject to a similar weakness. Where children come of a tubercular stock they need special care and attention during the early years of life, such care taking the form of securing sufficient wholesome food, abundant exercise in the open air, suitable clothing, constant cleanliness, and the avoidance of undue mental strain. Where sound health can be maintained the child may escape its inheritance, and may acquire strength sufficient to save it from the tendency to disease, and thus the weakness acquired by one or two generations may be conquered by the care and favourable circumstances of their successors, but where any organ becomes diseased it may open the way very quickly for the entrance of the constitutional disorder. What has been said in reference to children will apply equally to adults, and persons who have reason to believe they inherit this tendency should endeavour to overcome it by the means we have indicated.

**TU'BEROSE** (*Polyanthus tuberosa*) is a plant belonging to the order LILACEÆ, commonly cultivated in conservatories in this country for the beauty and fragrance of its flowers. It is a native of India, but is largely brought to England from the south of Europe, where it grows in the open air. It grows to a height of 3 or 4 feet, and has rounded bulbous roots, and linear lanceolate leaves. The flower stalk bears a spike of numerous large pure white fragrant flowers. The perianth is a funnel-shaped incurved tube, with a six-parted limb, and the stamens are inserted in the throat of the tube. A variety with double flowers has been obtained in cultivation. The tuberosa is largely cultivated in the south of France for the essential oil yielded by the flowers, which is used in perfumery.

**TUBES OF FORCE.** See LINES OF FORCE.

**TUBES, GEISSLER'S.** See GEISSLER'S TUBES.

**TUBE WELL**, an ingenious American invention which was introduced into England in 1867, and has for its object the obtaining of a moderate supply of water from underground in an easy and expeditious manner. It consists essentially of a length of tube furnished at one end with a tempered steel point, and perforated for about 16 inches from the end with small lateral apertures, which is driven into the ground by means of a monkey or rammer, and to which other lengths can be screwed on until a sufficient length is obtained. When water is reached a suction pump is attached to the tube, and as the water is drawn up, it is found that a small pool is formed round the perforated portion of the pipe, and the water, which at first is charged with sand or mud, soon clears, the small stones drawn against the apertures serving as a kind of filter. When it is desirable to remove or close the well, the rammer can be used to extract the tube from the ground, so that, under favourable conditions, the same length may be repeatedly used. Tube wells were used by the Federal armies in the United States with very excellent results, and their use greatly assisted the operations of the British troops in the Abyssinian campaign. Tube wells now form a recognized part of the equipment of a modern army, and in civil life they are very useful where water can be reached at a moderate depth below the surface, and where the ordinary boring is unsuitable.

**TUBICOLÆ** is an order of ANNELIDA forming with the order ERRANTIA a group, Polychæta, marine worms with well-developed lateral appendages. The Tubicolæ live in a calcareous or leathery tube, which they build up by means of a glutinous secretion, sometimes with the help of mud, grains of sand, fragments of shells, &c. The

animal is not organically attached to its tube, which may be free or attached to a rock or other foreign body. Most of them are sedentary (whence the name *Sedentaria*, sometimes applied to the group), and live in the sand or in holes of rocks. The species are very numerous, and are found in the sea at all depths, feeding on vegetable matters.

The body of these worms presents three distinct regions. The lateral appendages or parapodia are small, and the bristles with which they are furnished are short and flat. Attached to the head are numerous branchial tufts and thread-like tentacles. The pharynx is short and often not eversible. The chief families are *Scrupulidae* [see *SERPULA*] and *Terebellidae*.

**TUBINGEN**, a walled city of Württemberg, in the Black Forest, is situated on the left bank of the Neckar (over which there is a stone bridge) at its confluence with the Ammer, about 20 miles south from Stuttgart, and had 11,739 inhabitants in 1880. The town is irregularly built in the old style, and lies on a slope. Tubingen is chiefly interesting on account of its university, founded in 1477, which occupies the ancient castle of the counts Palatine, and is governed by a chancellor, appointed by the king, and a senate. Among its earliest professors were Melancthon and Reuchlin. It has faculties of medicine, jurisprudence, philosophy, Protestant and Catholic divinity, and political economy. Attached to it are a library of 150,000 volumes, a good collection of natural history, a cabinet of medals, a collection of mathematical, astronomical, and philosophical instruments, an observatory, and a botanic garden. The university attained great notoriety in consequence of the extreme rationalistic views propounded by Professor Baur and others of the *TUBINGEN SCHOOL*. Among the principal public edifices in the town, besides the university, are St. George's Church; the town-hall, built in 1435; the Protestant seminary; the Catholic college; the museum; the court of justice; the city hospital, a very spacious building; and the infirmary and lying-in hospital. There are several printing-offices, gunpowder mills, an antichamber, dye-houses, breweries, woollen-cloth factories, and a dry saw, fulling, and other mills on the Neckar and the Ammer, besides which the town has a good trade in agricultural produce, wine, and fruit.

**TUBINGEN SCHOOL**, the name given to a new school of historical-philosophical theology, which has exercised a great influence on religious thought and biblical criticism. Its leading principle is a close and practical interpretation of the various portions of the Bible, and its leaders were Strauss, Baur, and Zeller. The school owes its name to the fact that its writers are, or have been, connected with the celebrated university at TUBINGEN.

**TUBULAR BRIDGE**, a bridge consisting of hollow girders so large that the traffic of the bridge passes through the interior of them. Box-beams, or small hollow beams of wrought iron of a four-sided form in cross-section, are of comparatively old date; and it is uncertain by whom they were first introduced. A great tubular girder is distinguished from a box-beam by requiring special contrivances for stiffening the iron plates which form its top, bottom, and sides.

The first invention of tubular bridges is due to Robert Stephenson, who in 1814 proposed a bridge of that kind for carrying the Chester and Holyhead Railway over the Menai Strait. His first proposal was to use a wrought-iron tube of elliptical section. Sir William Fairbairn, who was consulted with Stephenson as engineer of the proposed bridge, investigated by experiment the best form of girder for the purpose, and in consequence proposed the rectangular form, which was adopted; and he also invented the cellular structure for giving sufficient stiffness to the top, and to such parts of the bottom as may be subjected to a compressive strain. The cellular structure consists in having two layers of plate iron, with the space between them

divided by longitudinal plate-iron partitions into "cells," or rectangular tubes, about 2 feet square. Mr. Eaton Hodgkinson co-operated in the experimental investigations. The first tubular bridge was erected in 1818: it was that which carries the Chester and Holyhead Railway over the river Conway in North Wales; its span is 400 feet, and it consists of a pair of parallel tubular girders, one for each line of rails. Then followed the Britannia Bridge over the Menai Strait, commenced in 1849 and opened in 1850; it also consists of a pair of parallel tubular girders, each 1511 feet long, which stretch continuously over four spans, two in the middle, of 460 feet each, and two at the ends, of 230 feet. The clear height above high water is 100 feet. Each girder was hoisted to its place in four divisions by means of great hydraulic presses; and then the divisions were connected over the piers so as to make the girders continuous.

In the Victoria Bridge, over the river St. Lawrence, at Montreal, in the railway bridge over the Nile, and in some other examples, Stephenson abandoned the cellular structure, and stiffened the tops of the girders partly by slightly arching them transversely, and partly by means of longitudinal iron ribs. The Victoria Bridge has twenty-five spans; the central span is 330 feet; each of the other, 220 feet; it was finished in 1860.

The sides of a tubular girder are usually stiffened by means of vertical iron ribs, and the junctions of the side with the top and bottom by iron gussets and brackets. An ordinary width for a tubular girder is 16 feet inside; and in some of the best examples the depth is about one-sixteenth part of the span. For further information, see Fairbairn on "Tubular Bridges;" Clark on the "Britannia and Conway Tubular Bridges;" Hodges on the "Victoria Bridge;" Rankine on "Civil Engineering."

**TUBULIFERA** is a suborder of insects, belonging to the order HYMENOPTERA, distinguished by having the posterior segments of the abdomen retractile, and provided with a membranous ovipositor, composed of a single piece. It contains only one family, CHRYSIDIDÆ.

**TUCKERMAN, JOHN**, an American clergyman, born in Boston, 18th January, 1778, died in Havana, Cuba, 20th April, 1810. He graduated at Harvard College in 1798, and from 1801 to 1826 was pastor of a Unitarian Society in Chelsea. He then laboured as a missionary among the poor of Boston. In 1812 he was instrumental in forming the first charitable society for the benefit of sailors in the United States, and subsequently the American Seamen's Friend Society, and a "Benevolent Fraternity of Churches" for the support of a city mission, called the "Ministry at Large." He also visited Great Britain, and promoted similar organizations there, more especially the "Domestic Missions" to the poor. In 1830 he wrote a prize essay "On the Wages paid to Females." He published reports to the "Fraternity of Churches" (12mo, 1831; 2nd ed., 1832), and "Principles and Results of the Ministry at Large."

**TUCUMAN**, a town of the Argentine Republic, the capital of a state of the same name, situated on the Tala, 310 miles N.N.W. of Cordova, is the third town in the republic. It has a cathedral, Jesuits' college, &c., with considerable manufactures, and a trade in oxen and mules. A railway connects with Cordova and Rosario, on the Parana. The population is about 20,000.

**TUDEUS, TUDEIDES** (Lat. *Tudeus, Tydides*). Tudeus was a hero of Greek mythology, famous rather as being the father of Diomedes, the great hero of the siege of Troy, than on his own account. Diomedes is often called by his patronymic Tudeides. The legends about Tudeus are unusually bloodstained and revolting even for mythology. Thus, being the son of the King of Kaladon, he had to seek exile because of a murder he had committed; some give his father's brother, some his mother's brother,

some his own brother as the victim. King Adrastus of Argos received him and purified him of the murder in the recognized way, after duly professed repentance. Tudeus found favour with the king, who gave him his daughter in marriage. Later on he accompanied Adrastus in the famous expedition of the Seven against Thebes, and fell at the hand of Melanippus, not, however, before he had inflicted a death-wound upon his foe. As they lay dying the goddess Athena took compassion on Tudeus, hastened to Zeus and obtained nectar which would heal his wounds and render him immortal. The seer Amphiaræus, brother-in-law of Adrastus, recognized the goddess and her purpose. He hated Tudeus, and quickly cutting off the head of Melanippus cast it to the dying hero. With furious rage Tudeus fixed his teeth in it, and otherwise dealt with it so brutally that the goddess shuddered with horror and left him to his fate.

**TUDOR**, the surname of a line of English sovereigns, consisting of Henry VII. (1485-1509), Henry VIII. (1509-17), Edward VI. (1547-53), Mary I. (1553-58), and Elizabeth (1558-1603). The family descended from a Welsh gentleman, Owen ap Tudor, who married Catharine of Valois, widow of Henry V. One of their sons, Edmund, earl of Richmond, married Margaret, daughter and heiress of John Beaufort, duke of Somerset, whose father was an illegitimate son of John of Gaunt by Catharine Swynford. The offspring of this connection were afterwards legitimated, but excluded from the succession. The only son of Richmond and the heiress of Somerset, Henry, duke of Richmond, on the extinction of the direct male line of John of Gaunt, was accepted by the Lancastrian party as their chief. He was invited over from France to deliver the country from Richard III., whom he overthrew at the Battle of Bosworth in 1485, and became king. His marriage with Elizabeth, eldest daughter of Edward IV., in 1486, united the claims of the houses of York and Lancaster. The Tudors were bold, energetic sovereigns, patriotic, though often despotic; and under them England was prosperous and powerful.

**TUDOR STYLE**, in architecture, is the name given to the transitional style from the latest true Gothic style, the Perpendicular, to the mixture of styles called Elizabethan. See ELIZABETHAN ARCHITECTURE.

The Tudor style was remarkable for redundancy of ornament, and especially of repeated ornament; splendour of effect being gained by numbers of points, not very fine in themselves, rather than by fine forms or elegant sculpture, as in the earlier Gothic styles. The extensive internal use of wood panelling was another characteristic, and the walls of Tudor halls and chapels are usually quite covered by it. The favourite roof for the large Tudor halls was the "fan-tracery" vaulting, and in the finest examples of the style large pendants hang like heavily sculptured stalactites from the intersections of the ribs. The windows are quite square at top, often with a peculiar square drip-stone taking the place of the Gothic arch-moulding; and the doorways depart from the finer form of the pointed arch and take a flatter shape, struck out from four, and not from two centres, hence called the four centred or Tudor arch. This is very characteristic of the style, and is well shown in Plates III. and IV. **ENGLISH CATHEDRAL ARCHITECTURE**. The doorways were also exceedingly elaborate, often being set in frames of heavy carving. The greater number of Tudor palaces were built under Henry VIII.; but it is to his father, Henry VII., that the favourite Tudor window, the projecting bay, was due. It was used first in his palace of Richmond, now altogether gone. The noblest Tudor edifice is Hampton Court Palace, which Cardinal Wolsey built. [See Plate IV. **ENGLISH CATHEDRAL ARCHITECTURE**.] Here the oriel window was freely introduced, supported on a corbel, and not like the bay, which rose from the ground itself. The wall is crowned with a battlement.

The great gateway runs through a square tower with octagonal turrets at each angle. The splendid hammer-beam roof of the great hall is shown in the Plate already referred to. The chimney-pieces and fireplaces were often enriched with beautiful carvings and sculptures, and the chimneys themselves for the first time became an architectural feature, being carried boldly above the roof and grouped so as to form an important and picturesque feature of the building. Finally, a large use of moulded brickwork and terra-cotta is highly characteristic of domestic Tudor architecture. The remarkably picturesque buildings for domestic use produced by the Tudor style cannot be better instanced than by the mansion of Haddon Hall, Derbyshire, which is the most attractive example of the style as applied to a dwelling.

**TUFDIAN BEDS**, in geology, the Northumberland representatives of the calciferous sandstones (Lower Carboniferous) of the Scotch coalfield. [See **GEOLOGY**.] They were originally so named by George Tate, and consist mainly of shales and sandstones, with little calcareous matter, and yielding scarcely any fossils. Marine shells, including the nautilus, are occasionally discovered, and one division—that of the Harbottle Grits, near Chillingham—has furnished specimens of the fresh-water mussel *Anodonta jukesii*, characteristic of the Upper Old Red Sandstone of Ireland. See Professor G. A. Lebour's "Outlines of the Geology of Northumberland."

**TUFA** or **TUFF** (Lat. *tophus*, whence Ital. *tuffo*); in geology, a general term applied to a loose porous rock. It is commonly employed for the chemically precipitated deposits of carbonate of lime found in fresh waters, and with greater correctness for the accumulations of volcanic dust and debris around volcanoes. The former are known as *cal-tuffs*, the latter as *volcanic tuffs*. The first are met with on a small scale, in the Derbyshire Cotes, where the deposits are often worked for ornamental rockery stones. This stone is the famous **TRAVERTINE** of Central Italy.

Pre-historic Rome was built entirely of true volcanic tufa, for all the famous hills of Rome are composed of it, and the builders there found their material ready to their hands. Tufa is really a hardened mud, formed by the steam out of the dust and sand of volcanoes. It occurs at Rome because the city stands upon volcanic ground. Tufa varies from a loose sort of sand, which can be dug up with the spade, to a soft stone, about as hard as the English Bath stone. It does not weather well, but its harder varieties are durable if protected from frost and wet. The Romans used a coat of stucco (hard plaster) for this purpose. The best Roman tufa is dug from the Aventine. It varies in colour from a dark brown, slightly reddish, to a light yellow. The tufa of the Palatine Hill seems to have been originally the red-hot scorie sent forth by the volcano, which fell in their soft condition upon trees growing there, burnt them, and incorporated the resulting charcoal with their glowing mass. The so-called Wall of Romulus is built of this extraordinary mixture of stone and charcoal.

**TUILERIES, THE**, was for many years prior to 1871 the principal state residence in Paris. The ground on which it stood was once a tile-yard (*tuilerie*), and was purchased by Francis I. in 1525. Catherine de Medici, with Delorme for her architect, began the edifice, to which additions or alterations were made by Henry IV., Louis XIV., and Louis Philippe. The façade was nearly 1000 feet long, irregular in architecture, but picturesque and imposing from its mass. Louis XVI. was detained here as a prisoner, and here during the great Revolution the Assembly held its sittings. It was afterwards occupied by Bonaparte as first consul and as emperor, was sacked and plundered in 1830, and restored to its former splendour and gorgeously decorated by Louis Philippe, who fled from it in 1848, when it again became the prey of the mob. Then it became an hospital for the wounded, an exhibition of



pictures, and from 1851 the home of Napoleon III., who had been born here. The emperor, in a grand design whose success was equal to its daring, united the Tuileries to the Louvre, the two palaces being not far distant one from the other, by splendid connecting wings with lavishly decorated pavilions, the large space of the entire quadrangle thus formed being cleared and thrown open. The effect was most imposing. In May, 1871, during the dying struggles of the Commune, the Tuileries, together with other magnificent and historic structures of Paris, was ruthlessly fired and destroyed.

**TUKKAY** (literally, "the great lizard," i.e. crocodile). a favourite instrument in Siam and Burma. See SIAM, section *Music*, for a short description of the tukkay.

**TULA**, the capital of a Russian government of the same name, situated at the confluence of the Tulitza and the Upa, 110 miles south of Moscow, is an important commercial and manufacturing town, with 63,510 inhabitants, a cathedral and numerous other churches, monasteries, a seminary and gymnasium, industrial museum, theatre, founding hospital, and house of correction: there is likewise an institution, called the Alexandrium, for the education of children of noble families. The imperial manufactory of arms employs several thousand workmen. It owed its origin to Peter the Great, but has risen to its present importance since 1817, through the efforts of an Englishman, Mr. Jones, of Birmingham. Tea urns, bells, locks, mathematical instruments, and cutlery of various kinds are also manufactured here. There are likewise in Tula numerous tanneries, distilleries, breweries, manufactories of Russia leather, candles, soap, tallow, beet-root sugar, woollens, linen, sealing-wax, paint, and Prussian blue. Bristles are prepared in large quantities, both for home consumption and export; and there is a considerable trade in corn and hemp.

**TULIP** (*Tulipa*) is a genus of plants belonging to the order LILIACEÆ. The plant is distinguished by its inferior bell-shaped perianth of six segments, by the erect position of the anthers, and by the sessile three-lobed stigma. The species are herbaceous plants, developed from a fleshy bulb. The flowers are mostly solitary on a lengthened scape. The Garden Tulip (*Tulipa Gesneriana*) is the best known of all the species, and has perhaps had more attention bestowed upon it than any other plant that produces only flowers. The garden tulip has a smooth stem, from 18 inches to 3 feet high, bearing a solitary erect large flower; the leaves are ovate-lanceolate, glaucous, and smooth. It grows wild in the Levant, and appears to have been cultivated by the Turks in their gardens from an early period. The tulip was first described in 1559 by Gesner, who saw it growing in Augsburg. It appears to have been introduced into England about 1577. A little later, in Holland the cultivation of this plant became the object of an extraordinary mania. In the early part of the seventeenth century the passion for the possession of tulips became so strong among the Dutch, that dealing in them became one of the most important money speculations, and the bulbs were sold and re-sold at enormous prices, in the same manner as stocks are on the Stock Exchange of England. It became in fact a gambling transaction, in which persons ventured their capital, in the hope that particular kinds of tulips would realize a higher price. The tulip is still zealously cultivated, and many hundreds of varieties have been established. The Wild Tulip (*Tulipa sylvestris*) is considered by some botanists not to be a true species, but to be a reversion to the natural state of the garden tulip. In England it occurs in the counties of Norfolk, Suffolk, Hertfordshire, and Middlesex, in a chalk soil. It has also been found at Aburdour (in Fifeshire, Scotland), in the southern parts of Germany, and in Switzerland, Italy, and France. It has yellow fragrant flowers, and blooms in

April and May. The Agen Tulip (*Tulipa Oculus Solis*), found at Agen in France, grows wild in Italy, Germany, and other parts of Europe. The flowers are large and bell-shaped, of a fine scarlet-red colour, each petal marked with a broad black yellow-edged spot at its base. It blossoms in April and May. The Early Dwarf Tulip (*Tulipa aureolens*) is supposed to be a native of the south of Europe. It blooms in March and April. The flowers are of a scarlet colour, edged with yellow, and give out a sweet scent, for which this plant is more cultivated than on account of its colour or form.

**TULIP-TREE** (*Liriodendron tulipifera*) is a tree belonging to the order MAGNOLIACEÆ. In America, where it is a native, it is also known by the names of White Wood, Canoe Wood, Saddle-tree, Tulip-bearing Lily-tree, Virginian Poplar, and the Poplar. It is one of the most magnificent inhabitants of the forests of the temperate parts of North America. It abounds in the middle states of the Union, in the upper parts of the Carolinas and of Georgia, and is still more abundant in the western country, particularly Kentucky. These trees sometimes attain a height of 140 feet or more, and their trunks measure 20 feet in circumference. The most common dimensions, however, are from 70 to 100 feet in height, and from 18 inches to 3 feet in the diameter of the trunk. In this country, into which it was introduced in 1688, it grows to a height of from 50 to 90 feet. It is a smooth deciduous tree with large bright green stipulate leaves, which are four-lobed and somewhat saddle-shaped, the terminal lobes being abruptly truncate. The flowers are solitary, terminal, large, resembling those of the tulip, fragrant, greenish-yellow, variegated with orange within; they have a calyx of three deciduous sepals, and a corolla of six erect petals, forming a cup or bell. The bark has a bitter aromatic taste, is a good tonic, and has been advantageously employed in intermittent fevers. The timber, which is easily wrought, takes a good polish, with a yellowish grain. It is used by the Indians in the construction of canoes, and is also employed by cabinetmakers and for the panels of carriages. This tree is successfully cultivated in England as an ornament for pleasure-grounds. It does not flower in this country until it has attained an age of from twenty to thirty years, and seldom ripens its fruit here. It thrives best in deep loamy soil. The foliage assumes in autumn a rich golden yellow tint.

**TULIP-WOOD** is the striped rose-coloured wood of *Physocalymna floribunda*, a tree belonging to the order LYTHRARIÆ. This beautiful wood is imported from Brazil, and is used for inlaying costly pieces of furniture, and for turnery, &c.

**TULL, JETHRO**, an English agriculturist, born about 1680, died in January, 1740. He owned an estate near Hungerford, on the borders of Oxfordshire and Berkshire, and observing the advantage of cultivation of plants in rows, and of stirring and pulverizing the soil between them, he introduced this system of cultivating the soil. But he adopted the erroneous principle that manure was not essential, as finely pulverized earth and moisture were sufficient for the growth of plants. This ruined him, and brought discredit upon his system. He published a treatise on his new mode of cultivation (1731), and detached essays, which were collected in 1751, and republished by William Cobbett in 1822.

**TULLAMORE**, a market-town of Ireland, the capital of King's County, situated near the centre of that immense tract of peat moss known as the Bog of Allen, which occupies so large a space in the centre of the island. It is the principal town on the line of the Grand Canal, and from its central situation is a place of considerable business, and great quantities of corn and other provisions are forwarded by the canal to Dublin. There is a large distillery, two breweries, together with various other branches of



trade connected with the supply of a large town and populous district. The gaol and court-house, the Protestant church, Roman Catholic church, and public schools occupy prominent sites. There are barracks, market-house, union work-house, meeting-houses for Dissenters, &c. The population in 1881 was 5098.

**TULLE**, a town of France, in the department of Corrèze, 46 miles south-east of Limoges, singularly situated in a deep narrow valley on both sides of the river Corrèze. It has a public library and an hospital, and also an important arms factory. Though none is now made here the linen fabric called tulle probably derives its name from the place. The remains of the cathedral date from the ninth century. The population in 1886 was 14,615.

The town is supposed to be not older than the seventh century; but about 3 miles northward are the ruins of Tintignac, probably the *Batignium* of Ptolemy, exhibiting traces of an amphitheatre and other extensive edifices.

**TULLIA**. [See **SERVIVS TULLIVS**.] Tullia was also the name of the beloved daughter of Cicero, known well to literary students through the great orator's correspondence, and there usually called by the pet name Tulliola. She married the profligate Dolabella, friend of Cæsar, and was divorced from him B.C. 46. She died in the following year, and her loss was a great blow to her father.

**TULLIVS, SERVIUS**. See **SERVIVS TULLIVS**.

**TULLOCH, REV. PRINCIPAL, D.D.**, an eminent Scottish theologian and author, was born 1st June, 1823, near Bridge of Earn, Perthshire, his father being the parish minister of Tippermuir, near Perth. He entered the United College of St. Andrews when in his fifteenth year, and after completing his literary and philosophical studies there, he passed into the College of St. Mary as a student of theology, and in 1844 was licensed as a preacher in the Church of Scotland. His first charge, which he held for some years, was in Dundee, and from thence he removed to Kittina, Forfarshire, in 1849. In 1854, at the early age of thirty-one, he succeeded Principal Haldane as the head of St. Mary's College, St. Andrews, and as professor of divinity there, and in the discharge of the duties of the twofold office he spent the remainder of his life. His name was first made familiar to English scholars by his obtaining, in 1855, the second Burnett prize for an essay on "The Being and Attributes of God," the essay being afterwards published under the title of "Theism." His collegiate duties left him a large amount of leisure, which he turned to account by devoting himself to literary work, and he became a prolific contributor to the religious and philosophical literature of the day, much of his work being first given to the students in the lecture-room, and afterwards collected into separate volumes. After the essay on "Theism," perhaps the more important of his numerous works are "Leaders of the Reformation" (1859), "English Puritanism and its Leaders" (1861), "Beginning Life: Chapters for Young Men" (1861), "The Christ of the Gospels and the Christ of Modern Criticism" (1864), and "Rational Theology and Christian Philosophy in the Seventeenth Century." In 1878 Tulloch was chosen moderator of the Church of Scotland, his graceful and genial manners enabling him to fill the office with singular dignity and acceptance. He was an eloquent preacher, his appearance being always eagerly welcomed in the chief pulpits of Edinburgh and Glasgow, while his breadth of mind and liberality of spirit made him the leader of what may be termed the Broad Church party in his communion. In addition to other prominent offices he was one of the Queen's chaplains for Scotland, dean of the Chapel Royal, and dean of the Order of the Thistle. He died at Torquay, 13th February, 1886.

**TULLVS HOSTILIUS**, the third king of Rome, is said to have reigned from B.C. 673 to 641. He is called a grandson of Hostus Hostilius, who fell in a battle against the

Latins in the reign of Romulus. His reign is described as the very reverse of that of his predecessor, the pious and peaceable Numa, and he himself as even more warlike than Romulus. The most memorable event of his reign is the war with Alba, which is celebrated in ancient legend on account of the single combat between the Horatii and Curiatii, and which was followed by the destruction of Alba. Its inhabitants were transferred to Rome, where the Carian Hill was assigned to them as their habitation. Several of the noble Alban families were incorporated with the Roman patricians, and the number of Roman equites was likewise doubled, while the great mass of the Alban population were treated as an inferior race. A war now arose between the Romans and the Sabines, in which the latter were defeated near the Silva Mutiliosa. Being pressed hard in this latter fight Tullus prayed to Saturn and to other gods, and in gratitude for his victory he founded, among other festivals and thank-offerings, the famous festival of the SATURNALIA. But after these successful undertakings the gods afflicted Rome with a pestilence, which was preceded by several awful prodigies. The king, however, continued his warlike pursuits, until at last he was seized with the disease. In order to propitiate the gods he consulted the *Commentarii* of Numa, and found the formula with which that sovereign had performed his solemn sacrifices to Jupiter Elicius. He attempted to do the same, and to call down the god, but he committed a mistake in his use of the sacred formula, and the god in his anger destroyed the king and his whole house by lightning. This is the story of Tullus Hostilius as told by Livy.

**TUMBREL** or **TUMBREL**, a machine formerly used for the punishment of scolding women, consisted of a stool or chair attached to the end of a long pole, and mounted in such a manner that the chair, with the offender placed in it, might be swung over a pond, and immersed as often as might be necessary. [See also **CRUISING STOOL**.] The tumbrel was also used as a punishment for brewers and bakers who transgressed the laws relating to them.

The term tumbrel, as a translation of *tumbeureau* (dunnecart) has only a verbal relation to the above; both being derived from *tomber*, to fall, because of their construction being such as easily to turn on a centre and eject or cause their contents to fall. As meaning a cart, "tumbrel" acquired an infamous celebrity in France during the Reign of Terror, for it was the conveyance employed to carry criminals to the guillotine. The name is likewise applied to the covered two-wheeled carts used to carry tools, &c., in a train of artillery.

**TUMOUR**. It is not possible to define exactly the diseases which are commonly classed under the name of tumours, and any definition in which the character of swelling (which is the true meaning of tumour) is included is unnatural: for there are several diseases which agree in the most important respects with some of those called tumours, but are not attended by any obvious enlargement or swelling of the part in which they are situated; and the same disease exists in some cases with, and in others without swelling. The greater part of the diseases which have been classed as tumours are examples of a large class of what may be called morbid or parasitic growths—diseased structures, which are not mere alterations of previously existing parts, but new organisms or living substances which have grown within the tissues of the body by powers of development peculiar to themselves, and which depend upon the surrounding parts only for their supply of blood or other nutritive fluid. In this class are included all those diseases described as solid or sarcomatous tumours, and those which are closely related to some kinds of tumours, but are not accompanied by swelling, such as tubercle, certain forms of diffused cancerous growths, and some others.

The diseases known under the name of encysted tumours are entirely different from all others of the class in their pathological characters. The chief cancerous growths are noticed under their appropriate heading [see CANCER], and tuberculous growths under the name of the disease which is consequent on their development.

All morbid parasitic growths may be divided into malignant and innocent. The practical distinction between the two classes, from which they derive their names, is that an innocent growth or tumour is not likely to recur after being removed by operation; but a malignant growth is likely to recur in the same or some other part. Independently of the practical distinction, the most essential characters of malignant growths are—(1) that they may occur in almost any part of the body, although some parts are more liable than others, and each kind of growth seems to find its most appropriate seat in a certain organ, as cancer in the breast, tubercle in the lungs, melanosis in the liver, &c.; (2) that they have a tendency to infect the adjacent parts, and to propagate themselves from one part to another, probably by germs carried from the primary disease into the blood, with which they circulate till they meet with an organ in a fit state to supply them with the means of increase; (3) that they tend, through an intermediate process of softening (which appears to be consequent on the death of their constituent particles), towards ulceration; that this ulceration is of a kind which is at present incurable; and that in its progress it involves, almost without distinction of tissue, all the adjacent natural structures of the body, the particles of which, by their contact or combination with those of the malignant growth, seem first to assume a nature similar to that of the tumours, and then to perish with them; (4) that in general the minute structures of which they are composed are dissimilar to those of the natural organs of the body; and that their development does not proceed to the formation of any structure similar to the fully-developed tissues.

The distinctive characters of innocent growths are chiefly negative. They include most of those to which the name of sarcoma is now commonly given. Their appearances are so various, that the most practised morbid anatomists frequently meet with examples which they cannot certainly refer to any described variety. They may be distributed into the kinds of fatty tumour, cellular tumour, fibrous tumour, cartilaginous tumour, and osseous tumour, though, for professional purposes, a more elaborate classification, based upon the microscopical character of the growth, is employed. The great majority of small tumours are harmless in character, and often cause inconvenience rather than any other distress; but where they call for remedy, recourse must be had to a surgical operation. Not one of the medicines proposed for exciting their absorption is worthy of a trial. Of the means of removing them (when removal is possible), none is so safe, so expeditious, or productive of so little pain or inconvenience, as the knife; and whenever it can be employed, the sooner it is used the better; for, in general, delay will only increase the severity of the operation. For the operation itself, the only general rule is, that the whole of the diseased mass must be removed; any portion which is left will most probably become the nucleus of a similar growth. The particular proceedings must be varied according to the size, locality, and other circumstances of the tumour.

**TUM'PANON** (Lat. *tympanum*), the hand-drum of the ancient Greeks, was like our tambourine, but with a double parchment head, so that it became a very shallow drum. The Romans also used it, taking it, as they took most of their artistic forms and material, at second hand from the Greeks.

**TUMULUS.** See BARROW.

**TUN'BRIDGE** or **TONBRIDGE**, a market-town of England, in the county of Kent, on the north bank of

the Medway, 29 miles from London by rail. The town appears to have owed its origin to a strong fortress erected in the eleventh century, of which the entrance gate, flanked by two round towers, and part of the keep still remain. It consists chiefly of one broad street, and being on a declivity is remarkably clean. There are several stone bridges over the Medway, which is here divided into five arms, one of which is called the Tun. Near the principal bridge is a wharf, and the Medway is made navigable to Maidstone by means of locks. The ruins of the castle and of a priory remain. Population of the town proper, 9317. The parish of Tunbridge comprises 15,378 acres (including part of the town of Tunbridge Wells), with 35,919 inhabitants. Tunbridge is a quiet old town, and has been long noted for a manufacture of toys and turned wares, having also some exports of timber. The principal buildings are the numerous places of worship, including the parish church, restored in 1877-78; a town-hall; the grammar-school, which is most liberally endowed; public hall, erected in 1876; market-house, &c.

**TUN'BRIDGE WELLS**, a market-town and watering-place of England, 31 miles from London by the South-eastern and South Coast Railways, situated on the border of Kent and Sussex, part of it being in each county. The chalybeate spring, to which the town owes its origin, is nearly equal in strength to that of Spa, in Germany. When Henrietta, queen of Charles I., visited the Wells, she and her suite remained under tents. After the Restoration the place rapidly increased. The springs are in the centre of the town, and the pump-room and baths, public parade, ball-rooms, libraries, theatre, and market-house, are in a small valley inclosed by sloping hills—Mounts Ephraim, Pleasant, and Sion. The site of Tunbridge Wells was once supposed to resemble that of Jerusalem, which led to the application of these sacred names. There are several churches, numerous dissenting places of worship, an infirmary, dispensary, a friendly society's hall, and many schools and literary institutions. In 1867 the town was very efficiently supplied with water by means of extensive reservoirs, and a cemetery was laid out on the London road. The parade is broad, handsome, and is 175 yards long. It is called the Pantiles, from its having been paved with those materials soon after the date of Queen Anne, who gave a sum of money for that purpose. The population within the limits of the jurisdiction of the local board—including portions of the three parishes of Tunbridge, Speldhurst, and Frant (in Sussex)—is 21,308.

**TUNBRIDGE WELLS SAND**, a deposit of soft sandstone, about 150 feet in thickness, typically developed in the neighbourhood of Tunbridge Wells, Kent, and forming the upper part of the lower division of the *WALDEN FORMATION*. One of the harder beds constitutes a prominent feature in the picturesque scenery of the High Rocks at Tunbridge, and in some localities the stone yields numerous remains of the characteristic Walden fishes and reptiles. It was in this formation that Dr. Mantell discovered most of the bones of *Iguanodon* and other extinct reptiles now in the British Museum.

**TUNDAR'EOS** (Lat. *Tyndareos*), the father or putative father of the *Tyndaridæ* (or *Tyndaridæ*), most of whom were famous as heroes or demigods in the Greek mythology. Being expelled from his father's kingdom of Messenë by his half-brother, he fled to Thestios, king of Ætolia, with whom he found great favour, and whose daughter, Leda, he married. By the help of Heraklēs he was restored later on to his kingdom. Leda was beloved of Zeus, who embraced her in the form of a swan, and she bore four children at the birth. Poludeukēs (Pollux), and Helena by Zeus, Kastōr (Castor) and Klutaimnestra (Clytemnestra) by Tundareos. Of these, Poludeukēs and Kastōr were famous heroes, especially as boxers, taking part in the Argonautic and other expeditions, and eventually

winning immortality; Helena became the wife of Menelaos, and proved to be the cause of the Trojan War, and Klu-tainuëstra married (and in the end murdered) Agamemnon, the brother of Menelaos, and king of Argos. When Menelaos had married Helena he was invited by the aged Tundareos to come to Sparta, and the kingdom was given into his hands.

**TUNE**, in music, is a melody of a strongly marked simple metrical character, precisely analogous to the rhymed regular stanza of poetry. *Tune* and *Air* (not *Aria*) are almost synonymous. A large number of tunes are markedly divisible in halves, and these halves are also frequently duple in construction, so that we have here the four-line stanza of the old ballad metre. The bare element of this form is seen in the familiar hymn-tunes of our churches.

**TUNGSTEN** or **WOLFRAM**, a somewhat rare metal, found as a tungstate of iron and manganese in wolfram, a mineral found in Cornwall. It also occurs as tungstate of calcium in scheelite, and as a tungstate of lead in scheelite, both of which minerals are found in Bohemia. The pure metal is obtained by heating the oxide in a stream of hydrogen, or by subjecting the oxide, mixed with oil, to an intense heat in a charcoal lined crucible. It is obtained as a steel gray powder, which can only be melted by the electric current or by the oxyhydrogen blowpipe. It is one of the heaviest metals, the specific gravity being 17.2. The symbol is W, and the atomic weight 184. In the fused form it undergoes no change when heated in the air, but it is oxidized when heated with nitric acid or with caustic alkalis.

Tungsten forms an alloy with steel of great hardness, which has been much recommended for use in making tools, but the application has not been commercially successful. The alloy is very infusible.

There are three oxides of tungsten, the dioxide or tungstous oxide ( $\text{WO}_2$ ), the trioxide or tungstic oxide ( $\text{WO}_3$ ), and another oxide ( $\text{W}_2\text{O}_6$ ), which is a compound of the two first, or a tungstate of tungsten ( $\text{WO}_2\text{WO}_3$ ). Tungstous oxide is a brown powder which does not combine with acids, nor does it unite directly with alkalis. A tungstite of soda ( $\text{Na}_2\text{W}_2\text{O}_6$ ) can be obtained by reducing the tungstate by hydrogen; it is obtained in golden metallic scales and cubes strongly resembling gold. It is not acted on by any alkali or acid, except hydrofluoric acid.

Tungstic oxide is found native in Cumberland as wolfram ochre, but it is usually prepared by decomposing the tungstate of calcium by nitric acid. It is a yellow powder, and has been obtained in octahedral crystals; it turns green on exposure to light, and is insoluble in water and in most of the mineral acids. It melts and volatilizes before the oxyhydrogen blowpipe, and dissolves in solutions of the caustic alkalis and alkaline carbonates, forming a tungstate of the alkali. When these solutions are precipitated by an acid, tungstic dihydrate or hydrated tungstic acid ( $2\text{H}_2\text{OWO}_3$ ) is thrown down as a white gelatinous precipitate. If the solution is boiling the tungstic monohydrate or tungstic acid ( $\text{H}_2\text{WO}_3$ , or  $\text{H}_2\text{OWO}_3$ ) is deposited as a yellow crystalline precipitate. Tungstic acid is insoluble in water, but is soluble in the caustic alkalis, and combining with them forms tungstates, which are soluble in water; those of the metals are insoluble. There is another modification called metatungstic acid, which is soluble in water, and of which all the salts are also soluble in water. Tungstic acid forms neutral and acid salts, having the respective general formula  $\text{M}_2\text{WO}_4$  and  $\text{M}_2\text{O}_2\text{WO}_3$ , but many of the salts differ from these typical formulae. The tungstate of soda ( $\text{Na}_2\text{WO}_4$ ) is the only important commercial salt. It crystallizes with two equivalents of water in transparent rhombic tables, which are very soluble in water, and have a bitter taste. It is employed instead of stannate of soda as a mordant in calico printing, and is much used for

applying to muslin and other dress materials to render them unflammable. It is the most efficient salt known for this purpose.

Metatungstic acid is very soluble in water; the hydrated acid crystallizes in octahedrons, having the formula  $\text{H}_2\text{WO}_4 \cdot 7\text{H}_2\text{O}$ . The solution is intensely bitter. It may be boiled and evaporated without change. The metatungstates have the general formula  $\text{M}_2\text{O}_2\text{WO}_3$ . They are mostly crystalline and soluble in water. The metatungstate of soda ( $\text{Na}_2\text{O}_4\text{WO}_3 \cdot 10\text{H}_2\text{O}$ ) crystallizes in regular octahedrons, which are efflorescent.

There are two chlorides of tungsten—the hexachloride or tungstic chloride ( $\text{WCl}_6$ ) and the pentachloride or tungstotungstic chloride ( $\text{W}_2\text{Cl}_{10}$ ). Both are formed when metallic tungsten is burned in chlorine gas. Tungstic chloride forms dark violet scales with metallic iridescence. It melts at  $183^\circ \text{C}$ . ( $361^\circ \text{Fahr.}$ ) to a black liquid, and can be sublimed unchanged. The pentachloride crystallizes in black needles, and is not so easily melted and sublimed as the hexachloride. There are also two oxychlorides—the dioxychloride ( $\text{WCl}_2\text{O}_2$ ) and the monoxychloride ( $\text{WCl}_4\text{O}$ ). The former crystallizes in yellow scales, subliming at  $266^\circ \text{C}$ . ( $510^\circ \text{Fahr.}$ ); the latter in scarlet needles, which are very fusible and volatile.

The bromides are analogous in composition, and resemble the chlorides, the hexbromide ( $\text{WBr}_6$ ), the pentabromide ( $\text{W}_2\text{Br}_{10}$ ), the dioxybromide ( $\text{WBr}_2\text{O}_2$ ), and the monoxybromide ( $\text{WBr}_4\text{O}$ ).

There are two sulphides of tungsten—the disulphide ( $\text{WS}_2$ ) and the trisulphide ( $\text{WS}_3$ ). The former is a dark metallic powder resembling graphite. The latter is a dark-brown powder soluble in water. It unites with metallic sulphides, forming a series of sulphur salts known as sulpho-tungstates, and having the general formula  $\text{M}_2\text{WS}_4$ .

Tungstic acid also combines with silica, forming silico-tungstic acid ( $\text{H}_2\text{SiW}_4\text{O}_{42}$ ), which crystallizes in octahedrons soluble in water. It forms a number of crystalline salts called silico-tungstates. There are two other modifications of this acid—tungsto-silicic acid, which is isomeric, and silico-decitungstic acid ( $\text{H}_8\text{SiW}_{10}\text{O}_{36}$ ).

Tungsten is recognized by the pure blue colour imparted to a bead of microcosmic salt in the inner blowpipe flame. Soluble tungstates give a beautiful blue colour, due to the formation of the blue oxide of tungsten, when metallic zinc is introduced into the solution, saturated with sulphuric or hydrochloric acid. It is estimated always as tungstic oxide,  $\text{WO}_3$ .

**TUNIC** (Gr. *chiton*; Lat. *tunica*), the universal undergarment of the ancients. The Greek (Doric) *chiton* for men was an oblong piece of cloth arranged round the body so that one arm was put through a hole in the closed side, the two ends of the open side being fastened over the opposite shoulder by means of a button or clasp. The *chiton* hung quite open down the side, or perhaps in the case of long garments, was stitched together from the mid-thigh downwards. A girdle fastened it round the waist, and it was drawn up through the girdle to whatever height the wearer wished, hanging over the girdle in graceful folds. Later on short sleeves were sometimes added to the *chiton*, which then much resembled the chemises now worn by women. The luxurious Asiatic Greeks wore a *chiton* with sleeves to the wrist, but their custom was frowned upon by the stricter republicans. Artisans often wore the *chiton* unfastened on the right shoulder, merely thrusting their left arm through the hole of the garment, and leaving their naked right arm and breast free for work, and allowing the air to play freely on the body to cool it; the garment thus worn is most picturesque.

The Doric *chiton* for women was like that for men, save that it was fastened over both shoulders by clasps. It was drawn up through the girdle to the level of the

knee. The more familiar long *chiton* reached to the feet after being pulled up. The *double-chiton* was a piece of cloth half as long again as the body, folded down to the usual length, so that this free fold hung gracefully, like a sort of cape, about as far as the waist, and in front of the girdled "bosom" (*kolpos*) of the *chiton*; the upper line round the neck was in consequence a fold, not an edge. This overhanging part of the *chiton* afterwards appeared as a separate garment. The most usual form for women, however, was the half-open *chiton*, the open side of which was sewn together as high as the girdle. The materials were linen among the Ionians, wool among the Dorians. Gradually for male garments wool became almost universal, while for the richer ladies silk was imported from Asia as soon as the commerce with Persia had thrown open that country.

The Roman tunic was in earlier times the same as the Greek *chiton*, and was worn pulled through the girdle in the same way. About the time of Commodus, sleeves were added both for men and women, and in a late Roman bas-relief we see a fold-back of the sleeve, forming a cuff. The colder climate of Italy caused the Romans to wear more than one tunic: the Emperor Augustus used to wear four in winter, it is said. The Roman ladies wore two, the inner one plain and ungirdled, the outer one sleeved, girdled, and falling in long countless folds. This was as especially the dress of a Roman lady as the toga of a Roman senator. It was called the *stola*, and usually bore an embroidered *instita* or flounce at the foot. See *STOLA*.

**TUNICATA** is a group of animals, formerly classed among the MOLLUSCA, but now generally regarded as forming a link between the vertebrate and invertebrate subkingdoms. In recent classifications the Tunicata either form a distinct subkingdom, or are ranked as one of the primary groups of the Vertebrata. Their relationship to the Vertebrata was demonstrated through the study by Kowalevsky of the development from the egg, one of the most interesting features of which is the appearance in the posterior end of the body of an axial rod like body, which is considered to represent the *notochord* that is developed in the embryos of all vertebrates, but is replaced by the vertebral column in the later stages of the higher forms. There is also evidence in the tunicate embryo of pharyngeal gill-slits, and a tubular nerve-cord, corresponding in a striking manner to the early stages of the vertebrate embryo. [See VERTEBRATA.] The young are in many cases hatched as free-swimming animals, presenting considerable resemblance to a tadpole, and a few species (Appendiculariæ) retain this larval condition throughout life. The majority, however, become attached to rocks and other foreign bodies, and rapidly degenerate, losing most of their organs, and becoming polyp-like animals, frequently budding and forming large colonies.

The family Appendiculariæ contains a few species, retaining their larval character throughout life. One of the best known of these curious forms is *Fritillaria furcata*, a minute animal found swimming on the surface of the sea. It has a tadpole-like body, about one-fifth of an inch in length, with a long tail measuring one-third of an inch, curiously bent at right angles to the body, which latter is continued into a forked appendage. The tail contains the *notochord* (or more properly *urachord*), which is surrounded by muscles, and exhibits an obscure segmentation. The mouth leads into a broad pharynx, which is perforated by two large gill-slits. Overlying the alimentary canal is the nerve-cord. The sexes are united in the same individual.

The majority of the Tunicata form the order Ascidia (ASCIDIANS), some of which pass through a similar larval condition to that of the Appendiculariæ. The family SALPIDÆ contains two aberrant free-swimming genera, *Salpa* and *Doliolum*.

**TUNICIN**, a substance resembling cellulose, forming the mantle of the Ascidia. It is a colourless fabric, soluble only in concentrated sulphuric acid, and the solution on boiling with water furnishes glucose. The formula is  $C_8H_{10}O_2$ .

**TUNING**, the art of adjusting the several sounds of a musical instrument so as to make its scale approach to correctness, or of putting one note or one instrument in a given relation of pitch to another.

Some musical instruments have a permanent relative scale, all the parts of which, if changed at all, change together. Thus a horn or a flute may change its pitch from the heat of a room, but since all the parts change together, the whole effect of the temperature is corrected at once by lengthening the pipe of which the instrument consists. Other instruments require to have the parts of their scales compared with each other from time to time, owing to their several parts being unconnected and subject to unequal wear or to separate accident, such as the organ and pianoforte. Others again are so liable to these derangements as to require tuning every time they are used, as the violin class, the harp, drums, &c.

A perfect scale is impossible, that is to say one in which all the intervals, or even all the principal intervals, in every key shall be perfect. Let additional notes be introduced to make existing keys perfect, and those additional notes would themselves become the key-notes of new keys, requiring additional notes to make them perfect. [See TEMPERAMENT, SCALE, KEY, &c.] Again, the conditions of ordinary keyed instruments require that the octave shall consist of only twelve semitones, and though some organs have been constructed with more, to exemplify various theories of acoustical philosophers, it is not worth while to embarrass the subject by treating of any other scale than that of twelve semitones, the common property of all practical musicians.

The first point is to fix upon some one note, by the pitch of which all others may be determined. The only way of retaining a permanent pitch for use is by having an instrument which time will not alter. A standard pitch is usually obtained, or professed to be obtained, by the tuning fork, a steel bar bent into the shape of a two-pronged fork, and provided with a handle welded on to the point of flexure. When the prongs are sharply struck they vibrate, and if the instrument be then held to the ear, or placed upon the flap of a table, or any other sounding-board, a low and very pure sound is heard if the prongs be perfectly equal. These tuning-forks are usually made to sound either *c'* or *a'*, the former being used for pianofortes and the latter for violins, &c., and they would answer their purpose exceedingly well if they were tuned to one of the recognized standards described in the article PITCH.

The principal note being settled, the tuner must learn to tune that note in perfect unison with his fork, and then to tune the octaves of that note both above and below. This seems to be the most plain and straightforward part of the whole operation; nevertheless, easily as tuners take it, and readily as they refer to one of their octaves as being as good an authority as the original note itself, more pains than is usually taken might be well bestowed. A note and its octave, when the consonance is perfectly well tuned, should sound like one note: now considering that in a grand piano there are six strings to be tuned before an octave is ready, three unisons with the lower note and three with the upper, it is not so very easy to present that perfectly indivisible effect which a good artist ought to strive for. In fact the philosopher knows that the most difficult thing to tune is a unison, and the next difficult is an octave.

When extreme accuracy is desired it is always best to tune by a given error than to attempt the practically impossible task of tuning an absolute unison. The standard fork

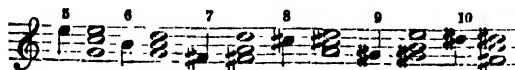
is counted most accurately—there are various ways of accomplishing this very difficult feat—and when its vibrations are known it is adjusted to about three beats flat, or thirty beats in ten seconds of known error. To obtain this error exactly would be a task of enormous patience, therefore the observer feels quite content with an error of thirty-two or thirty-five, &c., as the case may be. This standard fork being labelled with its error, it is not difficult to tune other forks from it. Raising the new fork rapidly to a pitch tolerably near a unison with the standard, it is then touched with the file very gently, so as by slow gradations to raise it above the standard fork by the thirty-two or thirty-five, &c., beats in ten seconds of known error. It is then allowed to cool, when it will sharpen, and in a day or so it is filed down again to the exact error. Perhaps it may need a third adjustment to be quite secure, but when this is done it is practically permanent, beyond all other tone producers, and represents the true pitch desired.

In the article TEMPERAMENT the reason is made clear why in practical tuning of pianofortes, organs, harps, &c., we aim not at correctness of intervals, but at definite incorrectness; not at any key being truly in tune, but at all keys being slightly and equally out of tune. Twelve successive Fifths overpass seven octaves by a small interval, and the problem of equal temperament is therefore to divide this small interval into twelve, and tune each Fifth flat by one-twelfth of the whole error, so that twelve equal-temperament Fifths shall exactly equal seven octaves. If we do this it is manifest that all keys are alike, for every note will be in precisely the same relation to its neighbours on either side, and the twelve semitones of the conventional octave will be precisely equal. The tuner gets his twelve Fifths not by starting at the lowest note (A A A), and proceeding A, E, B, F $\sharp$ , &c., to the topmost note (a''')—assuming the pianoforte, as usual, to have seven octaves of keys; he contrives, on the contrary, to get all his twelve Fifths into one octave by alternately tuning a Fourth down and a Fifth up. This is really the same as tuning all Fifths up, for it makes no difference whether we tune C to G downwards or upwards, if we set the relation truly between them; yet C to G downwards is a Fourth, and C to G upwards is a Fifth. The tuner first sets *c''* in unison with his tuning-fork as accurately as possible. Then he tunes an octave downward to *c'*, and now starts to compress his twelve Fifths between *f'* and *f''*, tuning each interval slightly flat as it occurs. The following is his method of procedure, the whole thirteen notes (twelve and the added octave *f''*) being called technically the "bearings."



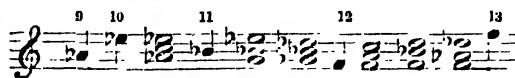
Arrived at the point 5 he tests his work by the chord of C (shown in minims). If this chord is too sweet his Fifths have not been flattened enough; if it is too rough he brings his Fifths a little nearer the truth. It may again be repeated that Fourths count down as Fifths up. A true Fifth is quite smooth, shows no beats at all, while a tempered Fifth beats slowly; and it is by listening to these beats that the tuner tells how far his Fifths are from the truth, and whether he has given them the exact error desired. The quicker the beats the further is the interval from truth.

Continuing the "bearings," we may for convenience sake write them an octave higher than they really occur.



An octave higher than written.

Here the tuner finds his 10 *d'* sharp has also to serve as *e'* flat, and his 9 *g'* sharp as *a* flat; he therefore also tries the chord of A flat. At this point we consequently repeat the last two notes of the bearings under their "flat" names.



An octave lower than written.

If on arriving at 12 *f* the tuner finds it is an equal-temperament Fifth below *c'* (whence he started), his task is accurately performed. As small errors tend to accumulate, it is difficult to accomplish this. Many tuners consequently tune the notes marked 12, 11, 10 in reverse order, adjusting 9 equally between 10 and 8, so as to avoid so great a chance of accumulated error. But as Fifths tuned in reverse order must be tuned *sharp*, this is evidently a most faulty practice. The proper way is by study to learn the exact amount of flatness required from the truth, and then to tune the whole bearings on the one plan.

**TUNING-FORK.** As the vibrations of a tuning-fork depend upon the general laws governing the vibration of rods, these will be considered in the present article.

The vibrations of rods at once divide themselves into three classes: (1) where the rods are fixed at both ends; (2) where they are fixed at one end; and (3) where they are free.

(1) When rods are thrown into vibration while fixed at both ends, they are found to divide themselves into nodes, in the same manner as stretched strings do (it must, of course, be apparent that the strings are fixed at both ends by the fact of their being stretched); but there is a considerable difference in the rate of alteration of vibration in the vibrating segments as distinct from the rate of vibration of the whole rod. For whereas half the string vibrates twice as fast as the whole string, half the rod vibrates nearly three times as fast. The successive "partials" of a string [see ACOUSTICS] take the series 1, 2, 3, 4, 5, &c.; but those of a rod fixed at both ends take the series 9, 25, 49, 81, &c., that is, 3<sup>2</sup>, 5<sup>2</sup>, 7<sup>2</sup>, 9<sup>2</sup>, &c. Probably the cause of this difference lies in the fact that the string is kept in vibration by tension, but the rod by its own elasticity.

(2) When the vibrating rod is fixed at one end and free at the other, as is the case with the common "iron fiddle" and the familiar "musical box," the partial tones follow a far more complicated law. The rate of the prime is to that of the second partial as 4 : 25, or as 2<sup>2</sup> : 5<sup>2</sup>, but that of the second is to that of the third partial as 3<sup>2</sup> : 5<sup>2</sup>, and then the series continues by the squares of the odd numbers. Taking 36 as the rate per second of the prime, the total series would run thus:—

$$36, \quad 225, \quad 625, \quad 1225, \text{ \&c.} \\ = (2^2 \times 9), (3^2 \times 9), (5^2 \times 25), (5^2 \times 49), \text{ \&c.}$$

Compare this with the rise in pitch of the partials of a string, and observe the greatly more rapid rise of the partials of the rod free at one end:—

Partial of a string:—36, 72, 108, 144, &c.

(3) The tuning-fork, the glass, metal, or wood harmonica, "straw fiddle," musical stones, &c., form the third class of vibrating rods, free at both ends, and supported at a nodal point. The pitch of such a rod is much more acute than that of a rod fixed at both ends, the ratio between the vibrations of their primes being 4 : 25, or 2<sup>2</sup> to 5<sup>2</sup>. Free rods divide by their first division not at one node but at two, each of these being a quarter from the nearest end; and therefore in all such instruments as the glass harmonica, &c., the rods are supported at the first and third quarters of their length. The relation

between the number of nodes into which such a vibrating rod divides, and the relative rate of vibration of the sections caused by the respective divisions, are as follows :—

No. of nodes, . . .	2,	3,	4,	5,	6.
Rate of vibration, . .	3 <sup>2</sup> ,	5 <sup>2</sup> ,	7 <sup>2</sup> ,	9 <sup>2</sup> ,	11 <sup>2</sup> .

If, instead of being straight, the rod is bent, the nodes of the first or chief division approach the middle of the rod; and the more the rod is bent the closer do they approach, until by the time it is bent into the shape of a tuning-fork, such as is figured in the Plate illustrating ACOUSTICS, the nodes are so close that a handle may be welded on without affecting the vibratory power of the fork. The distance from the prime to the next partial is very great in the tuning-fork, being 4 : 25, as in the case of rods fixed by one end, and this is most valuable in its character of a test of pitch. It is easy to reinforce the prime by a resonance box, hollow jar, &c., to such an extent that the distant and discordant first upper partial is quite drowned. Tuning-forks also are very stable. Mr. A. J. Ellis experimented with a set of tuning-forks made by the celebrated Chladni, who first studied this branch of acoustics, and he found them unaltered, though it was forty years since Chladni had counted them. In using tuning-forks very accurately it is necessary to protect the hands with leather, &c., as the warmth would flatten the fork; and the same cause will temporarily falsify it to a slight degree if it is struck repeatedly or bowed for long together. It comes to its exact pitch again in cooling. It is rather difficult to tune a fork very accurately, as long intervals must be allowed to elapse between the tunings, to permit the fork to cool. It is sharpened by filing inside the prongs near the tip, and flattened by filing inside the prongs near the base. The best way of tuning by a standard fork is by counting beats. If the use of the fork is to tune the pitch of 528 vibrations a second, it will do this much better if it is 521 beats than if it is 528. The note, or the second fork, is tuned so as to be a little sharp, and to beat four beats a second (or forty in ten seconds, for one always counts ten seconds in such experiments) with the standard. It is then accurate. But to tune it to a unison is far more difficult, for the beats get so very slow when the unison is closely approached as to be practically unrecognizable. One beat a second is difficult to count, and one beat in five seconds is not perceptible. In short, it is better to tune by an exact error than by a faulty unison.

Tuning-forks should be kept free from rust by wiping them with an oily rag every few months. They are then the most permanent and reliable standards of pitch that are known. Handel's tuning-fork is still extant, and is always measured with the greatest confidence by acousticians, sure that it sounds now just as it did 150 years ago.

**TUNIS**, a kingdom or "regency," now under the control of France, formerly one of the so-called Barbary States, comprises the tract of country included in the ancient Roman provinces of Zeugitana and Byzacium. It takes its present name from its modern capital, Tunis, the Roman *Tunes*. It is situated in the central part of the northern coast of Africa, and is bounded on the N. and E. by the Mediterranean Sea, on the W. by Algeria, and on the S. and S.E. by the Sahara and Tripoli. Its greatest extent from N. to S., where the boundary line is very well defined, is about 450 miles, while its breadth from W. to E. varies from 65 to 180 miles. The area is variously estimated, but 42,000 square miles is generally accepted. The number of inhabitants is calculated at 2,100,000, comprising 2,028,000 Mohammedans, 45,000 Jews, and 25,100 Roman Catholics, and a few Greek Catholics and Protestants. But according to other reports there are at the utmost 1,500,000 inhabitants. The majority of the population is formed of Bedouin Arabs and Kabyles.

The part of the northern coast from the boundary line

of Tunis and Algiers to Ras Sidi Ali-el-Mekki, or Cape Farina, is rocky and elevated. In the Bay of Tunis, from Ras Sidi Ali-el-Mekki to Ras Ghamart, it is low and generally swampy. Further south there opens the Gulf of Gabes, or the Little Syrtis, the shores of which are very little above the sea-level; and in general sandy rocks or cliffs of small extent are only found in a few places. The gulf is not more than 75 miles in extent from its northern to its southern point, and it penetrates into the mainland about 60 miles. In the neighbourhood of Gabes it has been proposed to let the waters of the Mediterranean into the interior of Africa, by cutting a waterway to the lower inland grounds.

The north-western portion of Tunis, or that which is inclosed by the boundary line of Algiers on the west, the valley of the Majerdah River, traversed by the railway which unites Algeria and Tunis on the south and east, and the Mediterranean on the north, is very mountainous. It contains the ranges of the Frigean and Mogody mountains, many of which rise to a height of 5000 feet. Their slopes are generally fertile. Near the latter range is Lake Benzart, which is 28 miles long by 14 broad, and connected with the sea by a channel 10 miles long. The river Majerdah—the *Bagrada* of the ancients—rises within the territories of Algiers, where it is formed by the junction of the waters of the Wady Serrat and the Wady Khamees: it runs for the most part through a shallow basin of moderate fertility. An uninterrupted tract of elevated ground traverses the country in a diagonal line between 35° and 37° N. lat., beginning on the south-west on the boundary line of Algiers, and terminating on the north-east in the peninsula of Dakhul and Ras Addar; it has several high summits, covered with forests. Between this high ground and the river Majerdah lies the plain of Tunis, which extends 20 miles on the north and west sides of the town, and to double that distance towards the south; it has a few ranges of hills, and a poor but well-cultivated soil. The Dakhul, or the peninsula which lies east of the Bay of Tunis, is occupied by a mountain range which extends from Jebel Zaghwān to Ras Addar. In it occur two deep depressions of inconsiderable width, through which roads are carried. A narrow level tract on the east side of the Dakhul is noted for its fertility.

Most of the inhabitants in the parts of Tunis already mentioned are engaged in cultivating the ground, in rearing cattle, and attending to the dairy. Notwithstanding the backward state of agriculture, wheat, barley, maize, tobacco, dhurra, pulse, olives (from which large quantities of oil are extracted), oranges, figs, grapes, pomegranates, almonds, and dates are produced in abundance. Cotton and indigo have been introduced as articles of culture, and some saffron and opium are raised. The sheep are noted for their wool, and the cattle, horses, and dromedaries are of fine breeds. The mineral products are salt and salt-petre, lead ore, copper, silver, and quicksilver. The lion, panther, ounce, lynx, wolf, and wild boar are the principal ferocious animals that inhabit the western parts of Tunis; for to the eastward of the meridian of Tabarca the forests cease, and the country is less woody.

The region which is separated on the north from the upper valley of the Majerdah by the Al Kaff Mountains, consists of an alternation of hills and plains of considerable extent. To the east of this lies the plain of Kerwan. Nearly in the middle of this table-land, which is more than 100 miles in length and about 30 miles in width, is the town from which its name is derived. The plain is separated from the sea by hilly tracts, which extend from Susa southward to a point opposite the islands of Karkenah. This tract is about 24 miles in width in the widest part, and contains a few spots of great fertility. The district which lies to the south of the three last-mentioned regions, and which contains the larger part of the country called



by the ancients *Byzacium*, once noted for its fertility, is at present almost a desert. The southern portion of Tunis is called the Jerid, or Beled-el-Jerid ("the country of palm-trees"). It extends from about 34° N. lat. southward to the parallel of the southern extremity of the great salt lake Al Sibbah, and is contiguous to the Sahara. This lake is 70 miles long from south-west to north-east, and about 26 miles wide on an average. In winter it is covered with water to the depth of 2 or 3 feet, but at other times most of it is a dry plain, the surface being entirely covered with a thick salt incrustation. The country which extends from its eastern shores to the Gulf of Gabes consists of a succession of hills. It contains a great number of springs and small water-courses, to which circumstance its fertility is owing: fruits and garden vegetables are here cultivated in great abundance. Near the boundary line of Tripoli is the island of Djerba (the "Island of the Loto-phagi" of ancient writers), about 18 miles long by 9 wide; it has four small ports or landing places, a fertile soil, and a dense population. In this southern portion of Tunis were probably situated the ancient Troglodytes, and here to this day are tribes who inhabit earth-dwellings. They are usually dug out of land composed of clay, sand, and plaster, this kind of earth affording a hold strong enough; and the inhabitants have no need to fear the earth falling in, although they make no supporting works for protecting their vaults.

The atmosphere of Tunis is generally pure and wholesome. The plague is not endemic or periodical, and is only known when introduced from other parts. In all other respects the climate and seasons resemble those of Tripoli. The summer heats are moderated by sea-breezes along the coast, and the winters resemble the English spring. During the summer and autumn rain is very rare; it usually falls in November, and continues at intervals until the month of April. The sinking of artesian wells will do much to fertilize the desert soil. There are several mineral springs in the country. Flies, noxious vermin, mosquitoes, gnats, ants, and the scorpion, are everywhere the torment of Europeans.

**Government.**—The authority of the Turkish Empire over Tunis has never been formally abrogated, but in 1881, on pretence of chastising the Kroumirs, an offending Arab tribe within Tunisian territory, a large force of French troops were massed within a few miles of the palace of the bey, who, under threat of immediate deposition, was then compelled to sign a treaty clearly acknowledging a French "protectorate;" and, to the especial chagrin of the Italians, the ancient Roman colony became a dependency of France. The French Resident is called Minister-Resident, and with two secretaries practically administers the government of the country under the direction of the French foreign office, which has a special Bureau des Affaires Tunisiennes. In 1882, the appointment of a staff of French judges was announced, and from 1884 they superseded the consular courts. The real revenue and expenditure are not known, but are each estimated about £600,000. In 1884 a loan was guaranteed by the French government by which the Tunisian Debt was consolidated into a sum of £5,000,000, and the floating debt £702,000. The loan was emitted as a perpetual 4 per cent. rente of £252,000, divided into 315,376 obligations of a nominal capital of 500 francs.

**Commerce.**—The foreign commerce averages £2,400,000 annually—£1,100,000 imports and £1,300,000 exports. Among the manufactures exported are soap, morocco leather, red caps, and shawls. Wheat and barley, as well as the inferior grains, olive oil, wool, hides, bees'-wax, dates, almonds, and sponges, are the principal articles of produce shipped. Those received from the interior of Africa, and afterwards exported, are—ivory, gold-dust, ostrich feathers, senna, gums, and madder-roots. The

imports are woollen cloths, cotton prints, calicoes, muslin, coarse linens, damasks, raw and wrought silks, fine wool, gold and silver tissues, coffee, sugar, spices, iron, tin, lead, hardware, cutlery, arms of all sorts, earthenware, paper, wine, spirits, and tobacco.

In 1886 the exports from Tunis to the United Kingdom were valued at £97,108, consisting chiefly of esparto grass and olive oil. The imports from Great Britain in the same year amounted to £78,738, five-sixths being for cotton manufactures. The trade with Central Africa passes through Gadamis. The caravans arrive at Tozer, Gabes, and Sfax about twice in the year, and barter their merchandise, which is thence introduced in various directions into Tunis.

Tunis has several lines of railway, running from the capital to Goletta, and other places in the environs, with a line to the Algerian frontier.

**Inhabitants.**—The Tunisines in general, like the Algerines, are a mixed race of Turks, Moors, and Jews in the towns, interspersed with a few Christians and renegades: while the people of the country are Arabs or Kabyles of different tribes.

**Antiquities.**—The ancient sites on the banks of the Majerdah abound in ruins, particularly at Dukkah (the ancient *Thugga*), consisting of temples, an arch, a number of cisterns, baths, barracks, gates, theatres, an aqueduct, and many inscriptions. At Ayedrah is a handsome triumphal arch, dedicated to the Emperor Septimius Severus, and columns of various beautiful marbles. At Kaff (Sicca), which, like Ayedrah, is on the western frontier, is still to be seen a paved street like those of Pompeii, and here likewise capitals, columns, and friezes are numerous. But the most stupendous monument of ancient times is on the site of Tyndrus, now called El Jem, where there is an amphitheatre which Shaw refers to the reign of the Gordians. This is one of the most perfect, vast, and beautiful remains of former times that is known to exist. Its extreme length measures 429 feet, and its breadth 368; and it is only surpassed in magnitude by those of Rome and Verona. It is nearly complete, with its seats, arena, and entrances, and retains almost the freshness of a modern erection. The great aqueduct which conveyed water to Carthage, 52 miles in length, may yet be traced by masses of stone and cement. In 1837, on the site of Carthage, was discovered a Roman villa near the sea-shore, buried 15 feet under ground. Eight large rooms were completely cleared. The walls were painted, and the floors were beautifully paved in mosaic. In another house still more beautiful mosaics were found, representing gladiators contending with wild beasts, horse-races, and men breaking in young horses.

**History.**—The earlier annals of Tunis correspond with those of ancient CARTHAGE. Like the rest of Barbary it was subjugated by the Romans in the time of Julius Caesar, and continued a Roman possession until overrun by Genseric and his Vandals, about 439. It was recovered by the Emperor Justinian, and remained a Roman fief until conquered by the Saracens. In 1575 it was subdued by Sinan Pasha, and incorporated in the Turkish Empire.

The reigning family of Tunis, occupants of the throne since 1691, descend from Ben Ali Tourki, a native of the Isle of Crete, who by force of arms made himself master of the country, acknowledging, however, the suzerainty of the Ottoman Sultan as previously existing. The new ruler assumed the title of Bey or regent.

TUNIS, a large and flourishing city and port, the capital of the above state, is situated on the west side of a small lagoon connected by the Goletta, a narrow strait, with the Bay of Tunis, about 3 miles from the ruins of ancient Carthage. It is at the edge of a large and beautiful plain, bounded in the distance by lofty mountains. The city is encircled by a high wall with six gates, around which is

another wall, encompassing the suburbs, having eleven gates or passes into the country, and measuring about 5 miles in circumference. The town is also defended by a castle completely commanding the narrow strait above-mentioned, and by several detached forts in other directions. Tunis contains about 140,000 inhabitants, and a large European town is growing up since the French occupation. There are five principal and many smaller mosques, some of them being very magnificent, especially that of Jussuf, which has handsome marble pillars, brought at immense expense from ruins in the interior of the country. In the middle of the city is an open space of no great extent, surrounded by well-supplied shops for the sale of manufactures. The bey's town palace is a modern building, but in the Saracenic style; and although situated in a narrow street is a very handsome edifice, with marble courts and galleries. Queen Caroline of England lodged in it during her visit to Tunis. There are extensive barracks, a theatre, and a few other public buildings. About  $1\frac{1}{2}$  mile from the city is the Bardo or summer residence of the bey, resembling a little fortified town.

The chief manufactures of this city are silks, woollens, embroidery, leather, soap, wax, earthenware, olive oil, and several celebrated essences, all of which are exported, together with grain, fruits, cattle, fish, ivory, gold-dust, coral, &c. In carrying on this trade, notwithstanding the admirable situation of the town, considerable disadvantages are experienced, though there are several schemes of improvement. The depth of water within the lagoon is not more than 6 or 7 feet, and hence even merchant vessels are obliged to lie outside the Goletta, and can only load or unload by means of lighters. The place of anchorage, however, formed by an inner bay off that of Tunis, has in its centre a depth of from 10 to 20 fathoms, and is so capacious that the largest fleet may ride in it with safety. The construction of the railway, which was opened in 1872, between Tunis and the Goletta, added considerably to the commercial facilities of Tunis; and a further improvement in this respect was made in 1880, by the completion of the line, 80 miles in length, to the Tunisian frontier, to join the Algerian railway of Guelma and Bona.

Besides the mosques of the Mohammedans, the Jews have their synagogues, and the Greeks and Roman Catholics have several places of worship.

**TUNKERS** (Ger. *Dippers*), commonly but corruptly *Dunkers*, a religious sect which originated in a small village on the Elber in Germany, but which since the beginning of the eighteenth century has belonged exclusively to the United States. In many respects they resemble the Quakers, inasmuch as they have no regular ministry, use great plainness of dress and language, and refuse to take oaths and fight, but they have also many customs peculiar to themselves. Thus, they practise adult baptism by immersion, and celebrate the Lord's Supper with accompanying love-feasts, the washing of feet, the giving of the right hand of fellowship, and the kiss of charity. They attach a high value to celibacy, but do not absolutely prohibit marriage, and they rely upon prayer and the anointing with oil, rather than the use of medicine, for the recovery of the sick. In their social life they are principally agriculturists, and in the vicinity of their settlement, where they are generally known as the *Harmless People*, they have a high reputation for uprightness and industry. As a rule they are Universalists, but the doctrine of universal salvation is not an essential tenet of the sect. They do not collect or publish any statistics of their numbers, but they are believed at present to include within their ranks over 100,000 persons.

**TUNNEL and TUNNELLING.** A tunnel is a subterranean or subaqueous way constructed for purposes of passage. In mining the term is often applied to horizontal excavations, especially to such as are known by the desig-

nations "gangway," "heading," "drift," and "adit," used as underground roads, or for the passage of water. In ancient times some important works of this character were accomplished, but in point of magnitude and difficulty of construction, these ancient undertakings have been far surpassed by modern works. At the same time the aqueducts of the ancient Romans, and of the Peruvians and Mexicans, included many remarkable tunnels. Among the many Roman aqueducts on which tunnels were built were the Aqua Claudia, of which  $36\frac{1}{2}$  miles passed underground; the Aqua Appia, built in 312 B.C., 11,190 Roman paces in length, 11,130 of which were underground and arched; and the Aqua Virgo, 14,105 paces long, of which 12,865 were underground. According to Livy, a tunnel was begun, at the instance of the Oracle of Delphi in 398 B.C., to tap Lake Albanus, which was 6000 feet long, 6 feet high, and  $3\frac{1}{2}$  feet wide. It had to be driven through hard lava, but no less than fifty shafts were sunk on its line, and the work was finished within one year. A similar work of greater magnitude was undertaken to connect Lake Fucinus (now Celano) with the river Liris (now Garigliano), which employed 30,000 men for ten years, and was finished at a vast expense A.D. 52. The accuracy of the surveying in these works is astonishing when we consider the rudeness of the instruments used, some descriptions of which have come down to us. During the middle ages few, if any, works of this kind were undertaken, and it was not until the second half of the eighteenth century that their use was revived in England by Brindley and Telford. The first modern tunnels, however, were but small works, and until their construction received an impetus from the introduction of railways the most famous was that which Brunel, at great cost and in spite of formidable engineering difficulties, carried under the river Thames from Rotherhithe to Wapping. See THAMES TUNNEL.

Modern tunnelling may be classed under two general heads, viz.—that through "soft ground," and that which passes through solid rock. Under the designation "soft ground" the miner includes all such material as clay, earth deposit, &c., which if tunnelled through, requires a temporary timber arch to hold it in place, until the permanent arch of brick or masonry is built. Loose rock, as its name indicates, is rock either so seamy and broken by folding or compression or so disintegrated as to require an arch, generally much lighter than those necessary in soft ground. According to the method generally adopted in driving a tunnel, the first step consists in laying down its centre line on the surface of the ground, which is effected with the aid of a transit instrument placed in a wooden observatory erected on an eminence. Shafts are then sunk to the level of the tunnel, and the direction underground is carefully defined. Further shafts, or even slopes, are opened up if possible along the length of the proposed excavation, so that it may be attacked from several points at once; and a "sump," or pit, is constructed at the bottom of each shaft to collect drainage water, which is removed by pumping. Working from the shafts, a small heading is usually pierced right through either at the top, centre, or bottom of the proposed work, and this is afterwards enlarged by sections to the required size, the mason or bricklayer following closely upon the heels of the excavator. The roof, in the case of soft ground or loose rock, is supported by a timber framework, before the brickwork or masonry is put up, and in some cases it is found to be safer and cheaper to leave this in place, and brick it in, rather than to remove it. Where the timber is removed, the space between the arch of the brickwork and the excavation is filled in with concrete. Where the ground is very treacherous and much water is encountered, an inverted arch is often put in across the bottom of the tunnel, to withstand the pressure from below. Of the shafts dug, some may be filled up, when the tunnel is completed, while



others are retained to assist in its ventilation. They are generally made of an elliptical shape, and are constructed of sufficient dimensions to allow the ascending slips and buckets to pass one another freely. The sides of the shafts are prevented from falling in by a framework of stout timber, or, when intended for permanent use, by a lining of brickwork or masonry. The latter are built about 10 or 12 feet from the side of the tunnel, and communicate with it by a small arched passage, their usual diameter being about 10 feet.

The process of excavation in soft ground does not call for special description; while the methods adopted in attacking hard rock by boring and the use of explosives, have been to some extent explained under MINES. It may be of interest, however, to notice in this place some of the very ingenious machines which have been designed in modern times for the purpose of cutting the long rock-tunnels required in the railway systems of the present day. The first great use of these machines was in connection with the boring of the Mont Cenis Tunnel. Figs. 1, 2, and 3, Plate I., represent the machine invented by Mr. Bartlett, an English engineer, which appears to have suggested to the Italian engineers the machine employed on the Mont Cenis Tunnel, which they claimed as their own design. Fig. 1 shows the distinctive peculiarity of Bartlett's construction, in the employment of an *air buffer* between the piston of the steam-engine and the percussion end of the jumper or drilling tool, which is shown at the right-hand side of the figure. When the piston makes its forward stroke from left to right, it drives forward along with it the left-hand air piston, and the latter, as soon as it has passed the air holes in the air cylinder, incloses and powerfully compresses the air in the latter. As soon as the elasticity of the included air has balanced the friction and inertia of the right-hand air piston, with its attached piston bar and jumper, these are driven forward before the compressed cushion of included air, and the stroke of the jumper is made, the whole of the momentum being directed against the rock at the bottom of the junction hole.

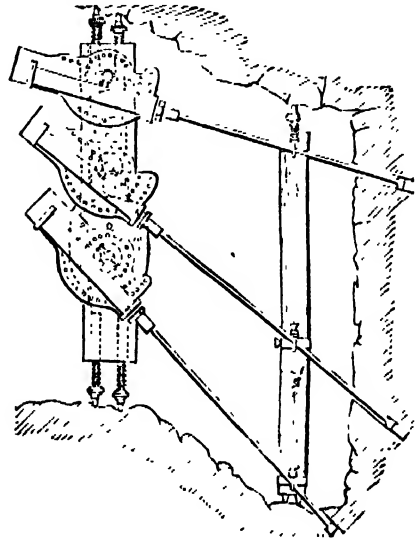
Fig. 2 is a lateral elevation, and fig. 3 a plan of Mr. Bartlett's machine, in which the relative positions of the steam and air cylinders and other parts will be easily distinguished.

The whole machine, fixed in or on its rectangular frame, rests on its lower side upon four friction rollers, one of which is seen on the lower part of the right hand of fig. 2, and by the action of the ratchet and pawl seen in the same figure, producing a slow rotation in the longitudinal screw beneath the carriage, the whole machine is slowly propelled forward as and at the rate that the jumper hole deepens.

Figs. 4 and 5 are devoted to the Mont Cenis tunnelling machines already referred to. Fig. 4 is a lateral elevation and fig. 5 a plan. Rotation in both machines is produced by a longitudinal shaft driven in much the same way. In both imprisoned air is made to limit the stroke, and the forward motion is communicated by a screw movement. Bartlett's machine gives rotation to the jumper without obliging the driving piston to revolve with it in the cylinder. In the Mont Cenis machine, and this is a decided inferiority, the plunger is made to revolve, and compels the jumper to revolve with it, producing much unnecessary friction.

Rock perforators of various descriptions, and all of more or less ingenuity, have multiplied of late years, and numerous inventors in England, the United States, and on the Continent have supplied the engineer with admirably-devised apparatus, to which our limited space permits only this passing allusion. We cannot conclude, however, without a few words in reference to the boring machine introduced into this country by Messrs. Doering and Sach, fig. 6. It is distinguished by its economy, simplicity, and speed. Compressed air is the medium employed

in working it, the piston rod of the compressed-air cylinder being provided with a socket for carrying the boring tool. The piston rod works through a bush on the front end of the cylinder, and from the opposite end of the piston another but smaller rod, connected with a cross-head, passes through the opposite end of the cylinder. A key or feather is formed or fitted upon the smaller rod, which works through a corresponding keyway in a bush on the rear end of the cylinder. By imparting a rotatory motion to this bush the same motion will obviously be transmitted to the smaller rod, and to the piston and boring tool. Suitable brackets are cast on the cylinder, which slide along parallel guide-bars, supported by a wrought-iron cradle, which serves to connect them to the main supporting standard of the



Fontenay's Rock-boring Machine.

machine. A screw thread is formed upon one of these guide-bars, upon which and between the cylinder brackets works a long nut carrying a bevel wheel, in gear with a second bevel wheel fast on the spindle of a crank handle, whereby the position of the machine on the guide-bars can be readily adjusted by hand or withdrawn if required for the purpose of changing the drill or commencing a fresh hole. In two holes made in the cross-head before-mentioned work the curved ends of a pair of levers, keyed upon a rocking shaft carried by brackets attached to the cover of the cylinder valve, such rocking shaft also carrying three short levers, respectively fixed at the centre and opposite ends thereof. One of these levers serves to work the slide valves, while the other two, through the intervention of pawls and ratchet wheels, impart the rotatory and feed-up motion to the tool. The main standard or support of the machine is carried on four wheels running on rails, and is provided with an upright column having a number of annular grooves cut therein, so as to form a species of cylindrical rack. A socket slides along this column and carries a worm, actuated by a crank handle, and gearing into a worm wheel on the axis of a pinion, which is in gear with the teeth of the rack; hence the height of the socket on the column can be adjusted with facility. The air-pressure employed is from 20 to 25 lbs. per square inch, supplied from a reservoir by flexible pipes; the general working speed is from 250 to 350 strokes per minute.

The rock-boring machine of M. Fontenay, though resembling in many particulars that of M. Sommeiller, has certain distinctive features of its own, is exceedingly

simplified, and has been adapted to a light and portable carriage, which admirably fits it for either mining work proper or for the piercing of small shafts and galleries. Other useful borers are those of McKean of the United States, and the machines of Colonel Beaumont and of the Sandycroft Company of England.

Very ingenious diamond drills have recently been produced by several inventors. This drill may be likened to a piece of iron gas-pipe, of which one end is faced with small diamonds; this is the cutting end, and may be used either in the vertical or horizontal position. The drill being made to rotate rapidly by steam cuts into the rock a ring-shaped hole, with a core in the centre, and overheating is prevented by water forced into the hole. An important recommendation of this drill is the speed at which it works. A number of drills may be fitted to the machine, and they work simultaneously, boring into the hardest granite at the rate of an inch per minute. Little difficulty is experienced in sharpening, and though the first cost is rather heavy, it is soon paid for by the increased quantity of work.

In connection with this portion of the subject a new method of tunnelling through clay or loose soil, which has been adopted with much success in some important works in and near London, may be mentioned. In this method a small heading is driven into the clay and supported by timbers, and then by pick and shovel about 18 inches of the soil to the circumference of the tunnel is next taken out. An iron shield, which might be likened to the cap of a telescope (the telescope itself representing the tunnel in which the men are at work), which is fitted with steel cutters on its outside edge, is then driven into the clay by hydraulic pressure. The hole which was partially made by hand labour is thus rounded off, a plate of iron covering the space bored, within which the tunnel cylinder is built up. The cylinder is made up of six pieces, with a key-piece at top. They are about 18 inches wide and one inch thick, with flanges through which they are securely bolted together, the metal being cast-iron of good quality. The tube fits exactly to the shape of the hole which the shield has cut, less the thickness of the covering iron plate attached, and as the shield goes forward the small space left round the outside of the tunnel tube is filled in with grout or liquid lime, which is forced through a hole in the iron plate by pneumatic pressure, and which very soon solidifies. The rate of progress in work of this description is very rapid, a subway having been driven under the Thames in 1887 in sixteen weeks, while the old Thames Tunnel occupied about eighteen years.

With respect to the more important tunnels of modern times, it may be mentioned that the railway tunnels of Great Britain have an aggregate length of upwards of 100 miles, and their average cost has been computed at £15 a yard.

The tunnel at Liverpool was completed in 1829, and being regarded as an engineering marvel was lit up with gas, and exhibited to the public once a week. Between London and Birmingham eight tunnels occur, their total length being 7336 yards. The South-eastern Railway is carried from Ilgham to Rochester in Kent, a distance of upwards of 2 miles, through a tunnel in the chalk formerly occupied by the Thames and Medway Canal. There are several tunnels on the London and South Coast line, the two longest occurring at Merstham and Clayton. One of the longest railway tunnels in England is that on the London and North-western line through the Stand Edge Hills, between Lancashire and Yorkshire. This tunnel, 3 miles and 69 yards long, is exceeded by a canal tunnel through the same hills, 3 miles 171 yards in length. Another tunnel through the Stand Edge Hills was completed in 1870, the length of which is 3 miles and 59 yards, or 39 yards longer than the Woodhead tunnel near

Sheffield. What is known as the "Metropolitan Railway" is carried chiefly under the thoroughfares of London, and embraces in all about 12 miles of tunnelling. Its great advantages are shown by the fact that it carries annually upwards of 50,000,000 passengers, being more than any other line of railway in the world. The longest work of unbroken tunnelling in the United Kingdom is that carried out by the Great Western Railway, to connect their railway system at Bristol with that in South Wales. It is  $4\frac{1}{2}$  miles long, thus exceeding the Stand Edge railway tunnel by nearly one mile and a half. One half its length ( $2\frac{1}{4}$  miles) is under the river Severn. Another British tunnel to which even greater interest is attached is that which connects Liverpool with Birkenhead under the waters of the Mersey, which was opened by the Prince of Wales in 1885. It is represented in section in Plate II.

Almost the greatest achievement of tunnelling in modern times is the vast work known as the Mont Cenis tunnel, opened on the 17th September, 1871, after the works had been in progress night and day, with little interruption, since 1857. It passes in reality under Mont Fréjus, about 16 miles west of Mont Cenis, where the mountain range is considerably thinner than at Cenis. The latter name perhaps attaches to the work because the popular highway over the Alps has been across Mont Cenis from time immemorial.

The idea of an Alpine tunnel was always a favourite one with Charles Albert, king of Sardinia, who as far back as 1832 discussed the project with eminent engineers. Its advantages were first pointed out by Signor Médail, a Savoyard, who indicated the spot most favourable for the work, and estimated the length to be traversed at 12,220 metres. This calculation was made in 1844, and in 1871, when the work was completed, Signor Médail's reckoning was found only 13 metres short of the truth, the exact length of the tunnel being 12,233 metres. Médail died in 1842, and various obstacles contributed to set the project aside until 1856, when the scheme was again laid before the Piedmontese Parliament by MM. Grandis, Grattoni, and Sommeiller. These gentlemen had combined together to produce the most perfect machinery for boring, ventilating, &c., and their scheme appeared so thoroughly feasible that Count Cavour entered warmly into the project, a bill was passed authorizing its commencement, and the work was inaugurated by King Victor Emmanuel in 1857.

The first point to be considered was the mode of construction, and in this unusual difficulties had to be overcome, inasmuch as operations had to proceed from the two extremities to the centre, and the engineers had to calculate to a nicety the meeting point of two tunnels driven towards each other from two sides of the mountains, under a hill upwards of 10,000 feet high. The slightest swerve or error in level would have been fatal; but thanks to the accuracy of the preliminary surveys, and to the care with which the observations at either end and on the summit were worked, this danger was avoided, and the two tunnels met with singular exactness.

Another difficulty which presented itself at first was the difference of level of the valleys on the north and south sides of the mountains, that on the north or French side being 750 feet lower than the one on the opposite side. This was partly obviated by carrying the railway by a zig-zag path some 416 feet up the mountain on the northern side. There remained 334 feet, which, when distributed over the  $7\frac{1}{2}$  miles of tunnel, was found to be equivalent to a gradient of 44 feet in a mile, or 1 in 120. It was determined to lay out the tunnel in two inclines, each descending from a summit level near the centre, but with a sharper descent on the northern side than on the southern. The tunnel itself is 12,233 metres long, equal to 13,365 yards, or about  $7\frac{3}{4}$  miles. The gradients ascend

at the rate of 22·2 feet in 1000 for 7781 yards on the French side, and descend at the rate of 0·5 per 1000 for 5583 yards on the Italian side. Our illustration, Plate III., gives a good idea of the tunnel at its Savoy end, and of the formidable difficulties which had to be overcome in its construction.

The works were commenced in 1857, but so long a time was consumed in preliminary labours that the machines did not regularly commence work until 1861. The tunnel is 26 feet 3 inches wide by 20 feet high, and has a double line of rails through its whole length. Two-thirds of the excavations were in schist; another portion in limestone, more difficult to work; and the rest in very hard quartz, the cutting of which absorbed time and labour to a serious extent.

The old diligences took nine hours to cross the Alps by the Mont Cenis route; the Fell railway, over the mountain, did the same in four hours and a half; the traveller from Paris to Turin now rattles *through* the Alps in twenty minutes. The cost of the undertaking was to have been borne partly by a railway company and partly by the Italian (then Sardinian) government. By the cession of Savoy to France in 1859 the northern side of the mountain became French territory, and France agreed to pay half the cost of the tunnel, and an additional sum for each year by which a term of fifteen years from 1st January, 1862, was reduced. The total cost was £2,600,000, towards which, besides its half, France had to pay the promised sum of £21,000 for each of the six years gained, or £144,000. The work, however, from beginning to end, was entirely carried out by Italian engineers.

The machinery used in piercing the Mont Cenis tunnel was designed by the engineers, MM. Sommeiller, Grandis, and Grattoni, and consisted of:—(1) The motive power, that is, the methods by which the water power of the region at either end was made to transfer itself, through the medium of compressed air, to the remote ends or foreheads of the work, there to set in action the penetrating machinery. (2) The boring or rock-penetrating machinery itself.

The power employed was water, which, as it fell from the opposite side of the mountain, was intercepted at a sufficient height to afford, at the Bardonnèche end, a head of 85 feet. Two sorts of machines were in operation, by which the air was compressed to a tension of five atmospheres by means of this water-power. At the Bardonnèche end these were of the sort called *à coupe de bélier*, and were, in fact, colossal water-rams.

Each machine was a U-shaped siphon pipe, furnished with certain runs, so arranged that the descending column of water in one, by rising into the other, compressed the air pent between it and the valves, which near the top discharged into a large air-vessel.

There were eleven of these *perceuteurs* at one end, and nine at the other, usually at work.

About eighty jumper holes were bored scattered over the face of the forehead, by changing the position of the several machines to each shift. When these were done, each from two-thirds of a metre to a metre and a half deep, the whole frame with the machine was drawn back on the rails about 100 yards. The holes were all charged with cartridges, and fired nearly simultaneously. A pair of temporary folding-doors, in advance of the place of the machines, were closed to prevent injury by chance projectiles.

The Mont Cenis tunnel, giving direct communication with Italy, *via* French lines, was completed in September, 1871, but even before that date the comparative ease with which it was seen that mountains could be pierced led to the projection of a rival tunnel through the St. Gotthard, which would afford a shorter route to the Italian peninsula, *via* Germany and Switzerland. Accordingly, in exactly

the same month of 1871 that the Mont Cenis works were completed, headings were pushed into the St. Gotthard, and in September, 1872, the tunnel was commenced at Airolo, on the Italian side, and in November following at Göschenen on the north or Swiss side. The Mont Cenis tunnel,  $7\frac{1}{2}$  miles long, took eleven years to pierce. The method of tunnelling the St. Gotthard was much the same, but experience evidently facilitated the work, for on the 29th February, 1880, but little over seven years from commencing, the last dividing stone fell, and the tunnel, of  $9\frac{1}{2}$  miles, was thus completed in about four years less than its shorter rival.

Though the main tunnel, however, is but  $9\frac{1}{2}$  miles long, the entire length of the railway from one side of the mountain to the other is nearer 20 miles, and consists of a series of shorter tunnels, galleries, viaducts, cuttings, &c., of such a stupendous nature as to make the 20 mile-length one of the finest engineering achievements of the age. At one point, near Biasca, the railway ascends from one level to another by a series of arches, forming a spiral in the solid rock. Where it emerges into daylight it is seen at three distinct levels, one above the other, as shown in Plate IV. The great tunnel enters the mountain at Göschenen at an elevation of 3600 feet above the sea, and comes out at Airolo at 3700 feet elevation.

It was not, of course, to be tolerated that German railways should thus divert profitable traffic from the French line through Mont Cenis, and while the St. Gotthard works were being carried out another railway was designed by the French, to be carried by an even longer tunnel through the Simplon. This would give a shorter route into Italy than either of the other two, and one that would consequently be preferred by passengers and tourists hurrying southwards, not only to Italy, but *en route* to Egypt and India. The Simplon tunnel, if constructed, will be 2 miles longer than the St. Gotthard, or no less than  $11\frac{1}{4}$  miles. As, however, the entrance is on a plain, the work altogether will be by no means so formidable as the other two.

The largest tunnel in the United States is that through the Hoosac Mountain in Massachusetts, which was commenced in 1855, and which, after many delays through financial difficulties, was completed in 1874. It is  $4\frac{3}{4}$  miles in length, is lined with masonry, has a shaft 1000 feet deep, and cost the state about 14,000,000 dollars. Important and interesting as these works are, however, they would be dwarfed by the proposed tunnel under the English Channel to connect England and France. A scheme of this character was advocated by M. Thomé de Gamond so far back as 1838, and the success of the Mont Cenis enterprise gave fresh life to the project. A Channel Tunnel Company was incorporated in 1872, and for several years very careful scientific inquiries were made, the result of which appeared to show the practicability of the scheme, and induced the English and French governments to authorize the commencement of the necessary preliminary works. These were commenced in 1876, and trial headings have already been driven to a considerable distance under the sea on both sides. In accordance with this project the tunnel would cross between St. Margaret's Bay, near the South Foreland, on the English side, to a point between Sangatte and Calais in France, and would have a total length, including the approaches on both sides, of 30 miles, 22 of which would be under the sea. It is believed by the engineers that the tunnel would pass through a continuous bed of hard gray chalk, which is impervious to water, and that it would need no internal support beyond a lining of 2 feet of concrete. Atmospheric engines would be employed, and these, it is believed, would of themselves secure sufficient ventilation, and would travel at the rate of 30 miles an hour. The works are at present suspended owing to the declarations of the military and naval authorities that the tunnel would be a source of danger in

the event of war, and a more reasonable fear on the part of some leading statesmen that the existence of the tunnel would increase that proneness to panic which forms such an unpleasant feature in the national life of to-day, but there is no reason to doubt the practicability and usefulness of the scheme apart from political considerations.

**TUNNY** (*Thynnus thynnus*) is a fish belonging to the MACKEREL family (Scombridae). The tunny differs from the mackerel (Scomber) in the position of the first dorsal fin, which, instead of being separated from the second by a wide interval, is prolonged close to it. Round the thorax it has a corselet of larger scales, a character which is wanting in the mackerel. There are nine finlets behind the dorsal, and anal fins above and below. There is a longitudinal keel on each side of the tail. The body is much thicker than that of the mackerel.

The tunny not unfrequently visits our coasts, following in the wake of pilchards and herrings, on which it preys. It is one of the largest sea-fishes known, attaining a length of 10 feet and a weight of 1000 lbs., or even more. It occurs on both sides of the Atlantic, and also in the Mediterranean. In the latter sea an extensive fishery of tunnies has been carried on from very early times, having been established by the Phœnicians on the coasts of Spain. The spectacle is described as being very exciting, and as one of the amusements of the rich Sicilians; while the fish constitutes one of the most considerable branches of the commerce of the island. The flesh of this fish is as firm as that of the sturgeon, but of much finer flavour, and is in great esteem on the Continent. The flesh salted was much esteemed by the Romans under the name *Saltamentum Sardicum*.

Another species is the Germon (*Thynnus germon*), met with in large numbers in the Pacific, where it is called by the sailors *Albacore*; it is distinguished by the length of the pectoral fins.

**TUNSTALL**, a market-town of England, in the county of Stafford, 4 miles N.N.E. of Newcastle-under-Lyme, and 168 from London by the North-western Railway, is in the vicinity of numerous collieries, potteries, chemical works, and veins of clay and iron ore. It has several churches and numerous dissenting chapels and schools, and a neat court-house. The population in 1881 was 11,241. Tunstall has increased with great rapidity from a mere village to a thriving town.

**TUPA** is a genus of plants belonging to the order LOBELIEÆ, consisting of tall herbaceous plants or undershrubs, with unbranched stems, alternate lanceolate leaves, and many-flowered leafy racemes. They are natives of the West Indies, Peru, and Chili, in which latter country they obtain the name *Tupa*. A singularly acrid and poisonous product is obtained from *Tupa Feuilleti*, which, if taken internally or applied to the skin, results in excessive vomiting and in violent inflammation. It is said, at times, to prove fatal. Some of the species are cultivated in this country for the beauty of their flowers.

**TUPAIA**. See BANGSHING.

**TUPELO** (*Nyssa*) is a genus of trees belonging to the order CORNACEÆ. About eight species are known, natives of swamps and the banks of rivers in North America, especially in the southern states of the Union. They are deciduous trees with entire, oblong or lanceolate, alternate leaves without stipules. The flowers are of two kinds, bisexual and male, upon different trees; they are small, greenish, axillary, solitary, or in small clusters at the extremity of long stalks. The calyx-tube of the perfect flowers is five-lobed and adherent to the ovary; the corolla is wanting, and the stamens are from four to ten. The fruit is a red or blackish purple drupe. Several species are cultivated in this country as ornamental trees, the foliage becoming an intensely deep scarlet in the autumn. The Tupelo Tree (*Nyssa villosa*), also called the Black

Gum or Sour Gum Tree, was introduced into England in 1824. In this country it is only from 10 to 15 feet high, but attains in Carolina and Georgia a height of from 60 to 70 feet. The Large Tupelo Tree (*Nyssa grandidentata*) is a lofty tree from 70 to 80 feet high, but in England, where it was introduced in 1735, it only grows to a height of 10 or 12 feet. The fruit is eaten in America. The Ogeechee Lime Tree or Sour Tupelo Tree (*Nyssa candicans*) is a much smaller tree. It is about 30 feet high, and a native of Carolina. The fruit is very acid, and is used like that of the lime.

**TUPHAON** or **TUPHŒUS** (Lat. *Typhon*, *Typhæus*), a monster of the Greek chaos, breathing fire and hurricane, overthrown by Zeus with a thunderbolt when in fight with all the gods, and buried deep in Tartaros under Mount Etna, through which his flaming breath rose and served the god Hēphaistos (Vulcan) as a forge.

Hesiod distinguishes two monsters, though other poets use the two names for one creature. Hesiod makes Taphœus, who was slain by Zeus, the elder, and the son of the primeval gods or spirits, Tartaros and Gaia. (Elsewhere it is said that he was a monster born of Hēra alone, enraged at the power of Zeus to generate Athēna.) Taphœus had a hundred heads, flaming eyes, and terrible voices; the storm-winds (not the ordinary four winds) were his children, the Harpies also, and Tupaôn, who was born to him of a hurricane. Tupaôn, the hurricane-monster, found a suitable consort in Echidna, the origin of the mediæval conception of the mermaid, a beautiful black-eyed woman to her waist, and thence onward a terrible serpent. This pair begot a whole crowd of monsters, the three-headed dog Cerberus, the Chimaira (Lat. Chimera), the many-headed dog Orthos, the dragons of the Hesperides and of Kolchis, the Sphinx, the Hydra, the eagle of Prometheus, the Nemean lion, Scylla, and the Gorgon.

**TUPPER, MARTIN FARQUHAR**, an English author, was born in London, 17th July, 1810. He graduated at Oxford in 1832, and in 1835 was admitted to the bar, but has never practised. His "Proverbial Philosophy, a Book of Thoughts and Arguments originally treated" (1838; 2nd series, 1842; 3rd series, 1867), brought him into immediate popularity, and, in spite of much contemptuous criticism, has passed through numerous editions, and been translated into several languages. In 1845 he was elected a fellow of the Royal Society, and he has received the Prussian gold medal for science and art. His numerous succeeding works include "A Modern Pyramid to commemorate a Septuagint of Worthies" (1839), a series of sonnets and essays on seventy celebrated men and women; "An Author's Mind" (1841), containing plans of thirty unpublished works; "The Crock of Gold," "Heart, a Social Novel," and "Twins, a Domestic Novel" (1844); "Probabilities, an Aid to Faith" (1847); "Hæcetus, a Budget of Lyrics" (1848); "Surrey, a Rapid Review of its Principal Persons and Places" (1849); "King Alfred's Poems in English Metre" (1850); "Farley Heath" (1851); "Hymns for all Nations, in Thirty Languages" (1851); "Ballads for the Times" (1851); "Heart, a Tale" (1853); "Probabilities" (1854); "Lyrics" (1855); "Stephen Langton" (1858); "Three Hundred Sonnets" (1860); "Rides and Reveries of Mr. Æsop Smith" (1861); "Cithara, a Volume of Lyrics" (1863); "Alfred," a play (1865); "Raleigh," a play (1866); "Our Canadian Dominion, Half a Dozen Ballads about a King for Canada," and "Twenty-one Protestant Ballads" (1868). In 1875 he wrote a play founded upon incidents of the American Revolution, and introducing Washington and contemporary characters. In 1886 he published his autobiography under the title of "My Life as an Author." His life has been spent principally in retirement at his maternal estate, in the parish of Albury, near Guildford, Surrey.

**TURANIAN RACE AND LANGUAGE.** The constituent members of this race (whose ethnological appellation has been chosen, in reference to the Turan of the Persians, the land of the northern nomads, in contradistinction to Iran) are as follows: (1) The Finno-Hungarian, Uralo-Finnic, or Ugrian branch. Its subdivisions are: *a*, the Ugrie, including the Hungarian or Magyar as principal member, with the Vogul and Ugro-Ostiak in and beyond the Ural; *b*, the Bulgarie, including the Tcheremisses and Mordvins, scattered tribes along the Volga; *c*, the Permian group, of the Permian, Sirian, and Votiak, in Eastern Russia; *d*, the Finnie or Tchudie, including the Lapp, the Finnish proper, or Suonnan, and the Estonian. The Bashkirs are also now considered as belonging to this branch. This is the most western branch of the family, lying chiefly within the limits of Europe; it is also the one of highest endowment, most perfect language, and most advanced culture. (2) The Samoyedic branch, comparatively insignificant in numbers, position, and history, and one of the lowest races of the Asiatic continent. The Samoyedes occupy principally the country between the Obi and the Yenisei, the inhospitable shores of the Arctic Ocean from the White Sea to beyond the North Cape of Asia, and in small groups the northern mountains of Central Asia. (3) The Turkish or Tartar (more properly Tartar) branch, the most widely spread of all, reaching from Turkey in Europe to beyond the middle of Central Asia, with important outliers in the yet more remote north-east, as the Yakuts of the Lena. Its subdivisions are very numerous, but are grouped in three chief classes: those of the south-east, in and to the east of Turkestan; those of the north, including among others the Kirghiz and Yakuts; and those of the west, stretching from Northern Persia through Asia Minor and the Crimea to Constantinople, and scattered in patches over the European dominions of the Sultan. (4) The Mongolian branch, composed of three families, East Mongols, West Mongols, and Buriats, inhabiting the present territory of Mongolia, the slopes of the Altai Mountains, and in groups the lands bordering on Persia, India, and China. (5) The Tungusian branch, of which the principal race is the Manchu, which has held China in subjection during the past two centuries. There is no question respecting the family relationship of these branches. The common name Turanian is more frequent than any other, but various scholars prefer the terms Mongolian (in the wider sense), Ural-Altaic, Seythian, or Tartaric; the first of these four seems to be gaining universal favour. It has been sought to extend still further the boundaries of this immense family, by attaching to it the Dravidian races of Southern India and other Asiatic peoples, and even tying on the Malays and Polynesians, and the North American tribes; but such sweepingly synthetic classification is, in the present stage of linguistic ethnology, to be regarded as utterly unscientific. Even the combination of the branches above-mentioned into one family is not beyond question; the Mongol and Manchu branches may yet be found unconnected with the others: As the Aryan or Indo-European languages are much more varied and diverse in their development than the Semitic, so they are, in their turn, vastly exceeded in this respect by the idioms now under consideration. The law of linguistic connection prevailing among the latter is quite peculiar; between tribes confessedly of near kin exist differences of linguistic material even in cardinal points, such as the pronouns, numerals, and important affixes of derivation. A marked similarity of linguistic method, however, runs through them all, and helps to stamp them as kindred. They are all formed on what is called the agglutinative type; that is to say, the root or theme everywhere maintains its form almost unchanged, and all formative syllables are suffixed, never prefixed to it; and they enter with it into no intimate union giving rise to forms which

are accepted by the mind, without analysis, as signs for the complex idea; they remain in the condition of loosely appended elements. There are no varieties and irregularities of nominal and verbal flexion; each language has but a single declension and (with unimportant exceptions) a single conjugation. The plural of declension is formed by a pluralizing particle, to which the same case endings are then attached as in the singular. Grammatical gender is unknown. The cases are numerous. Prepositions always follow the words they govern; as, indeed, it is a general rule that the governed word precedes the governing. Words connecting sentences, relatives and conjunctions, are in most languages hardly employed at all. A marked phonetic peculiarity running through all the dialects is the law of harmonic sequence of vowels; the vowels are divided into two classes, heavy and light (or hard and soft), and within the same word only heavy or only light vowels can follow one another; the vowel of a suffix, or those of a series of suffixes, changing to conform themselves to the character of that of the root. The languages are rich in harmonious and well-developed vocabularies, so far as the sound goes, and they abound in nice distinctions of certain kinds. Yet their rank in the general scale of language is low; they are deficient in sharp distinction of the principal grammatical categories, and awkward, cumbersome, and incomplete in the expression of thought. This character belongs to them in varying degree—the Manchu dialects are the poorest of all, and the Mongol do not much surpass them; the Tartaric idioms hold the middle rank: the tongues of the Finnic branch, particularly the Finnish proper and the Hungarian, possess a marked superiority to the others. Most of the languages of the family are known only in their present condition. None of the branches has ever had a properly national literature, if we except the mythic and legendary songs of the Finns and the mostly lyric popular songs of the Hungarian; but even some of the remoter tribes, under the influence and by the aid of foreign teachers, have acquired the art of writing, and have brought forth religious and historical works, while the Hungarian and Turkish have developed important literatures. It is also believed that on the cuneiform monuments of Mesopotamia and Persia is represented, in the inscriptions of the third order, a Ugrian dialect, now frequently designated as Accadian, and that we have then authentic evidence and remains of an ancient Ugrian civilization, which preceded and formed the basis for that of the other races in the same regions. F. Lenormant has recently (1874) written a grammar of the Accadian on this assumption of its value. These results of a small number of investigators are not yet fully accepted by scholars in general.

**TUR'BAN**, an Arabic word, used to designate the customary head-dress of the Hindus, Turks, and other Oriental nations. Its form is by no means invariably the same, but differs in different countries and among different ranks. It always contains two parts, however—the brimless quilted skull-cap, fitting to the head; and a very long sash or shawl, of cotton or linen, twisted round the cap. The voluminous folds of the turban at first sight seem an unnecessary weight upon the head, but like the equally voluminous waistband its origin lies far more in hygienic than in decorative ideas. The first, or something representing it, is an absolute necessity against sunstroke in very hot climates, and the second equally useful for the prevention of a chill of the great digestive organs—the chief cause of dysentery.

**TUR'BINE** (Lat. *turbo*, a whirling, or that which whirls), a water-wheel through which the water passes, guided by channels in the wheel itself, and usually by other passages exterior to the wheel which cause it to impinge on the wheel buckets at the proper angle to secure efficiency. The guide curves (as the walls of the last-

named channels are called) and the buckets of the wheels are usually both curved in such a manner that the water shall enter the wheel as nearly as possible without shock, and shall leave it with the least possible velocity. Turbines are generally, but not always, set in the horizontal plane, their axes being vertical; their size diminishes as the height of fall increases, and for falls of ordinary height they are very much smaller than the ordinary forms of so-called "vertical" water-wheels, an advantage which increases with the height of fall. Their smaller size gives necessarily a high velocity of rotation, which constitutes their most important advantage over the older forms of wheel; it permits the adoption of less heavy and expensive machinery for transmitting the power, dispenses with gearing, and gives greater regularity of speed and nearly equal efficiency under all heights of fall. The turbine was introduced into general use by Fourneyron in France in 1827, and soon after by Fairbairn in England and by Boyden in the United States.\* Turbines are classed as outward-flow, inward-flow, and parallel-flow wheels, according to the direction taken by the water in passing through them; but the principle already enunciated applies to all. Could the water be entered upon the wheel absolutely without shock, and discharged absolutely without velocity, the efficiency of the wheel would be perfect, and the energy of the fall would be all transformed into work. The efficiency of good turbines, under favourable circumstances, approaches 80 per cent., and has been known to exceed that figure; the usual value is about 75 per cent. The efficiency is determined as follows: The amount of water flowing through the wheel is ascertained by gauging; its weight, measured by the height of fall, indicates the maximum power of the stream, or the power available. The actual amount of power utilized by the wheel is determined by measurement with the dynamometer. If  $R$  = the resistance and  $v$  = the velocity with which the wheel overcomes that resistance,  $R \times v$  = the work done in the unit of time, and  $Rv = WkC$ , in which expression  $W$  is the weight of water flowing per second,  $h$  the height of fall, and  $C$  the coefficient of efficiency, or that fraction of the total available fall which is actually utilized by the wheel; the value of  $C$  is the "modulus" of the wheel. This value is capable of being estimated with approximate accuracy by the designer of the wheel, and the performance thus predicted by the use of formulas involving quantities dependent in magnitude upon the forms of the guiding channels. Turbines give the highest efficiency when their speed is between 0.5 and 0.7 of that due to the height of fall. The velocity of direct flow, or that with which the water passes through the wheel, is to be preserved as nearly uniform as possible, and the passages are to be given such form and magnitude of cross section as will insure that uniformity. The velocity of whirl is made as nearly as possible equal to the rotary velocity of the wheel, and the water is thus passed upon the wheel without shock. It should glide over the buckets without sudden change of velocity, and should finally pass out with a speed opposite in direction and equal in magnitude to that of the wheel, thus dropping out of the wheel with the least possible velocity of flow, and with its original *vis viva* transformed into mechanical energy.

Figs. 1 and 2 (Plate) represent Donkin & Co.'s vertical current turbine, which has a revolving disc of 3 feet 6 inches diameter, is altogether wrought of cast-iron, and prepared to be receptive either of a high or low fall of water. Fig. 3 represents a vertical section, and fig. 4 a horizontal section of another turbine, by Fontaine & Brault, intended for high falls of 70 to 80 feet. Schiele's turbine is shown in figs. 5 and 6. Fig. 5 illustrates its horizontal, and fig. 6 its vertical section. It is one of those which receive the water at the circumference, and deliver it at the centre.

**TURBOT** (*Rhombus maximus*) is a species of the family Pleuronectidae (FLAT-FISH), one of the valuable food-fishes. The genus *Rhombus*, which contains also the *BRILL* and the *WINTER*, has the body rhomboidal, with the eyes on the left side, the dorsal fin commencing on the snout, the mouth wide, with a band of small teeth in each jaw, and teeth on the vomers. The turbot attains a large size, growing to a length of 3 feet and a weight of from 70 to 90 lbs.; it is usually, however, very much smaller. The body is scaleless, with the upper surface studded with numerous roundish tubercles. The colour of the upper surface varies from gray to brown, sometimes spotted with black; occasionally both sides of the body are coloured. The turbot is generally found on banks in deep water, but is sometimes taken in estuaries. It feeds chiefly on small fish, crabs, and molluscs. It is abundant in the North Atlantic, and is also taken along the south coast of England. It is taken with the trawl-net or the long line, and is the most highly esteemed of all the flat-fish for food. An allied species, *Rhombus maritimus*, is found in the Black Sea; it has the body covered with very large bony tubercles.

**TURDÆ.** See TURDUS.

**TURENNE, HENRI, VICOMTE DE**, a distinguished French soldier, was the second son of Henri Duc de Bouillon and of Elizabeth of Nassau, and was born at Sedan, 11th September, 1611.

His father died in 1623; and jealousy of the designs of Cardinal Richelieu to the prejudice of the Huguenots induced his mother to send Turenne, in 1625, to Holland, to the charge of his uncle, Prince Maurice. Three months afterwards the latter died, but his brother, Henri Frédéric, was equally attentive to their young relative, who in 1626 obtained a company of infantry, and served under his uncle till 1630, in the Dutch War.

In 1630 he was sent by his mother as a hostage to the French court, in order to avert the designs of Richelieu against the sovereignty of his brother the Duc de Bouillon, still a minor. Turenne, whose reputation for military science had preceded him, was, though only nineteen, appointed to the command of a regiment of infantry. The first opportunity he now had of distinguishing himself was at the siege of La Motte in 1631: his conduct on that occasion procured for him the appointment of *maréchal-de-camp* (equivalent to that of major-general).

In 1635 the Cardinal de Richelieu sent four armies into the field to attack the Spaniards simultaneously on as many different points. Cardinal de la Valette was placed at the head of the forces destined to co-operate with the Swedes in Germany, and Turenne was attached to him as *maréchal-de-camp*. During the disastrous campaign that followed, he sold his plate to procure provisions for the soldiers under his immediate command; and while discipline was almost entirely lost and the baggage thrown away by the rest of the army, he retained his troops in their accustomed order, and abandoned only so much of the baggage as enabled him to procure waggons for those who were unable to march. He again attended La Valette in the campaign of 1636, on the Upper Rhine; and in 1637 in Flanders. The latter was a campaign of sieges, and their conduct devolved almost exclusively upon Turenne, who closed the campaign by driving the Spaniards across the Sambre. In 1639, after some further service on the Upper Rhine, he was sent to Italy, second in command to the Comte d'Harcourt, who, adopting the advice of Turenne in opposition to all the rest of his generals, laid siege to Turin, which surrendered 17th September, 1640. D'Harcourt then returned to France, leaving the army under the command of Turenne, who, however, was soon superseded in consequence of the Duc de Bouillon's quarrels with the French court. Turenne was next ordered to Germany, where, during the winter 1643-14, he succeeded, by raising money on his own credit, in re-equipping the army which



had been raised by the Duke of Weimar, and restoring its discipline. With this army, so great was his power of conciliating the affections and keeping up the spirits of the soldiery, he struggled through five campaigns.

In this period Turenne proved himself a thoroughly capable officer—energetic, skilful, versed in his calling, and learned beyond his fellows in the camp; and on two occasions, at least, he exhibited the fine strategic art—the faculty of combining large operations—which is the most distinctive mark of his genius. At the age of thirty-two he was made a marshal of France, having gained his *bâton* by sheer merit, in spite of obstacles of many kinds; and for the next thirty years he was, beyond comparison, the most eminent leader of armies in Europe.

When the disturbances broke out at Paris, at the commencement of 1649, Turenne rejected the overtures of Mazarin, but finding that resistance would be vain, retired to Holland with some of his personal friends. A hollow truce was soon after arranged between the contending factions, and he returned to France. When Condé was thrown into prison, he proved faithful to him, threw himself into Stenai, and prevented its being taken by the royal troops. He alone rallied the dispirited friends of Condé, procured the release of the prince, the exile of Mazarin, and the conclusion of a peace with Spain.

He returned to Paris in May, 1651, and having, as he said, discharged his duty to Condé by procuring his release from prison, declared for the regent and Mazarin, and accepted in 1652 the command of the royal army. It was soon evident that the same mind which upheld the Prince of Condé's cause when he was imprisoned, now struggled to uphold the royal authority against as fearful odds. But his genius maintained its ascendancy, and by the close of the year Condé was obliged to quit France: the king was crowned at Rheims, entered Paris, and consigned the Cardinal de Retz, the only remnant of the Fronde, to a dungeon.

From 1653 to the conclusion of 1659 Turenne's military capacity found ample scope in the campaigns in the French and Austrian Netherlands, which were concluded by the treaty of the Pyrenees.

The death of Mazarin in 1661, and the resolution of Louis XIV. to be thenceforth his own prime minister, though it did not raise Turenne to office, gave him a powerful influence in state affairs. The first sensible effect of this influence was the resolution of Louis to protect the independence of Portugal, which Mazarin had resolved to sacrifice to the Spaniards. Turenne's credit with De Witt was mainly instrumental in opening the negotiations with Holland which led to the treaty of commerce concluded with that power. When, in 1665, England and Holland severally endeavoured to induce Louis XIV. to assist in the war against the other, it was by the advice of his great general that the king tried to reconcile the belligerents.

Turenne had been educated by a moderate Calvinist, and like most active men who seek not a religion of abstract opinions, but of practical influence, he cared little for doctrinal points. The death of his wife, the daughter of the Duc de la Force, in 1666, removed the last tie that bound him to the Protestants; and he was received into the bosom of the Roman Catholic Church by the Archbishop of Paris. His change of religion cannot be called a conversion in the high sense of the word; it was merely an additional step in the process of changing him into a thoroughly naturalized Frenchman.

Louis availed himself of the peace between England and Holland, in 1667, to form a combination against Spain, with a view to make himself master of the Spanish Netherlands. The campaign in Flanders was the consequence. The victories gained by Turenne from 1672 to 1675 serve only, so far as he is concerned, to place in more brilliant light the qualities which he had amply displayed on former

occasions. He fell near Sassbach, 27th July, 1675, while preparing to lead his troops into action. His remains were at first buried at St. Denis, but were removed by Napoleon in 1800 to the Church of the Invalides.

It is a mistake to suppose that Turenne is the true parent of modern strategy. Parma had shown before what could be achieved by combinations on an extensive scale; and no move of Turenne, in his many campaigns, surpasses one or two of the great King of Sweden. But of Turenne it may be justly said that he developed this branch of the military art to a point of perfection before unknown, since the fall, at least, of the Roman Empire. He proved, by many notable exploits, how inferior campaigns of sieges are to campaigns of ably devised movements; and, more distinctly than had been seen before, he demonstrated how strategic skill, by bringing upon a given theatre a superior force to bear on the foe, may be decisive of the results of the contest. In fact, strategy, in its proper sense, made no real progress between his time and that when Napoleon appeared on the scene; and though his well-conceived and judicious plans are seldom marked by the dazzling splendour and originality of those of the modern Hannibal, they exhibit rare ability, and often great daring. Napoleon himself thought so highly of Turenne that, while an exile at St. Helena, he dictated a sketch of his campaigns, with critical observations thereupon.

**TURGOT, ANNE ROBERT JACQUES**, was born in Paris, 10th May, 1727. He was destined for the ecclesiastical profession, but entertained some conscientious objections; he therefore studied the law, and became a *maître des requêtes*. In 1761 he was appointed intendant of Limoges, and during the thirteen years that the province was under his administration, the more equitable distribution of imposts, the making of roads, the militia, the providing of subsistence for the people, and the protection of commerce, were the principal objects of his labours.

On the death of Louis XV. a wider field was opened for Turgot's enlarged and beneficent policy. The state of France demanded a reforming minister; and the public voice called him to the highest offices. He was at first minister of the marine; but after continuing only a month in this situation, he received the appointment of *contrôleur-général*, then equivalent to that of the English premier.

One of his first measures was the establishment of a free trade in corn in the interior of the kingdom. He also passed a law abolishing the *corvées* (which consisted in the repair of the high-roads by the compulsory labour of the poor inhabitants of the district) throughout France, a law which was revoked immediately after Turgot's removal from office. Having by enactments of this kind nearly abolished the servitude of the inhabitants of the rural districts, Turgot also abolished most of the restrictions and exclusive privileges under which the inhabitants of the towns suffered.

The characteristics of his financial administration were exactness in payments, fidelity to engagements, and a reduction of expenditure whenever it could be effected without hardship and injustice. "He had augmented the public revenue," says Condorcet, "without putting on a new impost, and after having suppressed or diminished several; and without having recourse to new loans. He had made repayments and diminished the debt. All these labours had been the work of twenty months; and two attacks of gout, a hereditary malady in the family of M. Turgot, had hindered him for several months from carrying on his plans." In the midst of these sufferings his enemies were at work against him: all those who had lived by abuses—nobles, courtiers, financiers, farmers of the revenue—united in a confederacy against the reformer, and drove him from his office in less than two years. After his retirement he occupied himself principally with the physical and mathematical sciences. He likewise indulged his early taste for

literature and poetry. But his attacks of gout became more and more frequent, and he died 20th March, 1881.

His principal works are—"Réflexions sur la Formation et la Distribution des Richesses;" "Lettres à M. le Contrôleur-Général sur le Commerce des Grains;" and "Extension de la Liberté du Commerce des Colonies."

**TURGUENIEV, IVAN SERGIEVICH**, the most celebrated of Russian novelists, and one of the greatest novelists of any age or country, was the son of an officer of cuirassiers, and was born at Orel, 28th October, 1818. At ten years of age his family removed to Moscow. In 1838 he went to Berlin where he studied at the university for three years. Then he lived for many years the life of a Russian country gentleman, devoting himself to field sports and writing for a periodical some sketches which were subsequently published as "Tales of a Sportsman." Imprisoned in 1852 for an article on the death of Gogol he was further sentenced to two years of country residence, and took to novel-writing to drive away *chui*. In 1855 he published "Dmitri Rudin;" in 1858, "Helene;" and "A Nest of Nobles" (translated into English by Ralston under the title of "Liza"); in 1862 appeared "Fathers and Sons;" in 1865, "Smoke;" in 1877, "Spring Floods" and "Virgin Soil" (the latter translated into English by Ashton Dilke). In addition to these works, all of which have been translated in America, he wrote a number of shorter tales. In 1863 Turgueniev went to live at Baden, and afterwards at Paris, where he mainly resided till his death on 3rd September, 1885. His body was removed to Russia. Turgueniev's novels are characterized by a sad and melancholy pessimism, but their wonderful insight into character, their extraordinary knowledge of life, constitute their author a kind of combination of Thackeray and George Eliot. To know the life of the Russian peasantry, to learn something of the great Nihilist movement, we can have no safer guide than the author of "Virgin Soil." While Turgueniev's sympathies are with Nihilism his artistic sense makes him a far more trustworthy authority than the mass of authors who have written on the great social problems of Russia.

**TURIN** (Ital. *Torino*), a city of Northern Italy, formerly capital of Piedmont, and (for a short time) of Italy, is 89 miles W. by S. from Milan, on the left bank of the Po, at the point where that river is joined by the Dora Ripaira. It lies in a wide and fertile valley, between the lower offsets of the Cottian Alps on the W., and the hills of Monferrate, which rise immediately above the right bank of the Po. The valley opens to the N.E. into the wide plain of Lombardy; and the general appearance of the city and surrounding country is scarcely to be surpassed in grandeur. The population of the city is 253,000.

The environs are very beautiful, and are studded with villas. The vicinity of the Alps, which adds so much to the magnificence of the scenery, has, however, an injurious effect on the climate, making the winter cold, and often sending down heavy storms of hail and rain. Railways connect Turin with Genoa, Novara, Vercelli, &c. The city is supposed to have been founded by a Ligurian tribe of Transalpine origin. Shortly after Hannibal crossed the Alps he made himself master of the territory in which it was situated; but after his expulsion from Italy the Romans took possession of it, and converted it into a Roman colony, which they called *Colonia Julia*; and this name was afterwards changed to *Augusta Taurinorum*, in honour of Augustus. It was taken and sacked by the Goths under Alaric, shortly after which it was surrounded by walls, but did not escape the ravages of the Longobards. It 1418 it was declared by Amadeus V. (into whose family it had been conveyed by a marriage with the heiress of the Marquis of Saluz) the capital of the states of Savoy; and following the fortunes of that dynasty, it ultimately rose to be the metropolis of the kingdom of Sardinia. It has sustained two memorable sieges—one in 1649, in the con-

test between the French and Spaniards, and the other in 1706, during the war of the succession, which ended in the defeat of the French by Victor Amadeus. At the time of the French Empire under Napoleon I., it was the chief town of the department of the Po. The first Parliament of the new kingdom of Italy was held here on the 18th February, 1861, but the seat of government was afterwards transferred to Florence, in accordance with a convention between the Emperor Louis Napoleon and Victor Emmanuel.

Modern Turin is one of the most regularly-built towns in Europe; nearly all the streets being in straight lines and intersecting each other at right angles, and the squares being also of a regular form. The streets are kept cleaner than in most other Italian cities, being washed during the night by water drawn from the Dora. The buildings, though massive and lofty, are, generally speaking, built of brick, and their appearance would be monotonous and unpleasant if their uniformity was not relieved by their height, by the endless variety of their sculptured fronts and rich decorations, as well as by fine bursts of scenery.

There is a magnificent stone bridge of a single arch, with a span of 150 feet, over the Po; and another of five elliptical arches over the Dora. Several of the principal streets and squares are lined with arcades; and the approach to the city from the west is by a noble avenue, which, commencing at the town of Rivoli, is one of the longest in Europe. In this part of the town is the handsome Piazza dello Statuto, built by an English company in 1867. The other finest squares are—the Piazza del Castello, which is of great extent; the Piazza di San Carlo, almost entirely surrounded by arcades, and adorned with a striking statue of Emmanuel Filiberto, by Marochetti; the Piazza di San Giovanni; the Piazza Reale, nearly in the centre, and from which run several handsome streets; and the Piazza dell' Erbe. The Strada del Po, leading to the bridge over that river, contains many lofty palaces. The Piazza del Castello is so called from an old castle or palace (now the Palazzo Madama) standing in the middle of it, which was formerly the residence of the dukes of Savoy. The northern side of the square is formed by the royal palace, a vast structure, with gardens at the back; the apartments, which are handsome, contain a rich collection of Flemish and Italian paintings, and a private library of 40,000 volumes, besides some curious MSS. and letters. Adjoining the palace is the Cathedral of San Giovanni Battista, with the annexed handsome rotunda chapel of Del Sudario. The cathedral is a Gothic structure. It was formerly very wealthy in plate and jewels, which Napoleon I. sold, and applied the proceeds to embank the Po, and build the bridge across that river. On the eastern side of the square is the great theatre, one of the largest and finest in Italy. The university, erected by King Victor Amadeus at the beginning of the eighteenth century, is a fine building. Its library contains above 225,000 volumes and MSS. The Cabinet of Medals contains 20,000 pieces. The Egyptian Museum, which is in the building of the Royal Academy of Sciences, is one of the richest in Europe. The royal armoury is a large and curious collection. Besides the statue of Filiberto, there is another of Charles Albert, also by Marochetti, those of Gioberti, presented to the city by the Milanese, the pair outside the Duke of Genoa's palace, and the Cavour Monument, by Dupre, finished in 1873.

Attached to the university are a museum of natural history, a museum of anatomy, a chemical laboratory and hydraulic apparatus, and a botanical garden at the Valentino, near the banks of the Po. The Royal Academy of Sciences—begun as a private society in 1769, and instituted as an academy in 1783—is divided into mathematical and physical, and moral, historical, and philological sciences; it has published numerous volumes of Memoirs.

Turin has also an academy of the fine arts, a phil-



harmonic academy, an agricultural society, a military college, an arsenal, barracks, a fine cemetery, royal gunpowder manufactory; an episcopal seminary, occupying an elegant structure; a royal military academy; and numerous schools, including institutions for the deaf mutes and the blind.

The charitable associations of the city are admirably conducted; they include hospitals for the infirm, for destitute children, and the old; lying-in and ophthalmic hospitals, three other hospitals; a lunatic asylum; a house of industry, the inmates of which are taught trades; an institution for affording out-door relief to the disabled poor; a *monte-di-pieth*; the *Retiro delle Rosine*, an asylum for the female poor founded in 1740 by a poor girl of Mondovì; and two penitentiaries, one for men and the other for women. The *Retiro delle Rosine* is a kind of religious community, in which 400 girls are maintained by their own labour. Other conspicuous edifices are the register offices, and the custom-house adjoining it; the town-house, with a lofty tower; the court-houses, &c.

Turin gives title to an archbishop, whose province extends over the sees of Alba, Acqui, Asti, Cuneo, Fossano, Mondovì, Ivrea, Pinerolo, Saluzzo, and Susa. It contains numerous churches, few of which are remarkable for their external architecture. There are numerous convents and nunneries; and a handsome Waldensian church, in the old Lombard style, was built in 1853. In the suburb on the right bank of the Po, facing the bridge, is the church *Della Gran Madre di Dio*, raised by the municipality, in memory of the restoration of the dynasty of Savoy, in 1814. It is an imitation of the Pantheon of Rome, is cased with marble, and adorned with marble pillars. Higher up on the hill is the Capuchin church and convent *Del Monte*, beautifully situated, and enjoying a splendid view. On a higher hill on the same side of the Po, but further north, about 2000 feet above the sea, and 5 miles from Turin, is the Royal Basilica of *La Superga*, containing the tombs of the princes of the house of Savoy. It is a handsome structure; its lofty dome is seen at a great distance, and is the first object that strikes the traveller on approaching the town. The terrace in front of this church commands one of the best views of the plains of Lombardy, girded by the Alps on the N. and the Apennines on the S.

The manufactures of the city comprise woollen cloths, silks, velvets, hosiery, hats, gloves, optical instruments, chocolate, liqueurs, tobacco, leather, paper, earthen and china ware, carriages, arms, and tapestry. The silk manufacture and trade employs a vast number of hands, and forms the principal source of wealth. Other articles of commerce are corn, wine, and fruit.

Turin possesses, in addition to the royal theatre alluded to above, the theatre of Carignano, for the opera; the theatre d'Angennes, for dramatic pieces unaccompanied by music; the *Vittorio Emanuele*, and four or five others. Besides the buildings already mentioned, some of the town-houses of the nobility and the royal residences in the neighbourhood are deserving of notice.

**TURKESTAN**, a vast region of Central Asia, about the exact limits of which there is much confusion. The Russians now often use indifferently the term *Turkestan* or *Central Asia* for their Central Asian possessions, mainly comprised within the Arab-Caspian depression, while the division which has its centre of government at Tashkend they call *Eastern Turkestan*. This name, however, can only properly be applied to a portion of the Chinese province of *Kashgaria*.

Russian *Turkestan* is bordered on the west by the Caspian, the Ural River and Mountains, on the east by the Pamir plateau, the *Thian-Shan* and *Alatau* ranges separating it from the Chinese Empire, northwards by the low ridge crossing the *Kirghiz* steppes about the fifty-first parallel, and forming the water-parting between the *Aralo-Caspian*

and *Ob* basins. But the administrative overrides the geographic division, for a large portion of West Siberia beyond this natural boundary is now attached to the *Turkestan* government.

Including this tract, which is alone about 400,000 square miles in extent, Russian *Turkestan* has an extreme length from the Caspian to *Lake Issik-kul* of 1400 miles west and east, with a breadth of nearly 1000 north and south, a total area of about 1,600,000 square miles, and a population of 6,500,000.

The country consists of about equal parts of highlands and lowlands; the latter falling to as much as 85 feet below sea level, the former rising to 25,000 feet above, in the Great Pamir.

The highlands, which lie mainly in the east, consist substantially of the Great Pamir and *Thian-Shan* systems, with the *Alai* and other sections all converging westwards, between the *Tarim* and *Aralo-Caspian* depressions. In many maps a range of mountains running north and south between *Eastern* and *Western Turkestan* is shown, and named the *Bolar-tagh*, but no such range exists, and the name is probably derived from a state of former times. It is difficult to assign a beginning or an end to the *Thian-Shan*, or *Celestial Mountains*, which separate the *Tarim* from the *Issik-kul* and *Ili* basins south and north, and stretch thence eastwards to about 120 miles east of *Hami* (*Khamil*), in 95° E. lon. At this point, which may be taken as their eastern limit, the *Thian-Shan* consist of a single ridge. But the whole system continually expands westwards, developing two or more lateral and parallel ridges, and in the extreme west ramifying into several distinct branches, which spread out like a fan far into the *Turkestan* lowlands. Of these branches the south-western-most are the *Alai* and *Trans-Alai*, which stretch in parallel lines for 240 miles along the northern edge of the Pamir, down to the *Turkestan* plains. It was long suspected that there were active volcanoes in the *Thian-Shan* system, but in 1881 it was discovered that the fires burning from immemorial times arise from ignited coal-beds. The whole system of the *Thian-Shan* is about 1500 miles long, east and west, with an average width of nearly 250 miles, and a total area of 400,000 square miles, or rather more than that of all the European highland systems taken together.

The *Turkestan* lowlands, which stretch from the Caspian and Ural River to the foot of the Central Asiatic highlands, possess no bold natural limits towards the north, where they merge imperceptibly with the West Siberian steppe. Southwards they are limited by the western continuation of the *Hindu-Kush* as far as the *Hari-rud* valley, and beyond that point by the North *Khorasan* highlands as far as the Caspian. They are now known to have at one time formed part of a vast inland sea communicating through the *Manich* depression across the *Ponto-Caspian* isthmus with the *Euxine*, and through the *Ob* basin with the *Arctic Ocean*. This inland sea is supposed to have escaped through the bursting of the *Bosphorus*, an occurrence which some writers have connected with the legendary deluge of *Deucalion* about 1530 B.C. But however this may be, were the *Bosphorus* again to be closed to a height of 220 feet, the former condition of things would again be gradually brought about.

The two principal rivers, the *Amu* and the *Syr*, the *Oxus* and the *Jaxartes* of the ancients, flow towards the *Caspian* and *Aral Seas*. The *Amu*, which is the largest river of Central Asia, rises in *Lake Sir-i-kol*, on the edge of the table-land of Pamir, at the height of not less than 15,000 feet. Tall reeds and sedges, with patches of woodland, line both streams; but in other parts a tree is rarely met with, and the only vegetation is a thin grass. Wastes of loose sand, continually shifting with the winds, small salt pools, and saline marshes, are characteristic of the general surface. Between the *Amu* and the *Syr* extends

the desert of Kizil-Kum, or "red sand;" that of Kara-Kum, or "black sand," is northward of the latter river, each of them being several days' journey across. The climate is dry and healthy; the sky is usually clear, and of the brightest azure; but great extremes distinguish the temperature, and hurricanes of tremendous violence sweep over the plains, driving along in clouds the sand or the snow, according to the season. In summer the thermometer rises to 108° Fahr. in the shade, and to 141° in the sun; in winter it sinks to from 12° to 25° below zero; the cold is aggravated by strong blasts, and the general want of wood for fuel. Towards the eastern and south-eastern borders the surface is varied by spurs and offsets from the high ranges of the Thian-Shan, and the Hindu-Kush, where there are well-watered valleys of great luxuriance and beauty. The climate there is not subject to such extremes of heat and cold as the western part of the country.

Limestone has been met with on the banks of the Kokcha, iron ore in many places, ruby and jade on the banks of the Amu, gold in its sands, turquoises north-west of Bokhara, coal between Kashgar and Khokan, isolated hills of red granite near the Irtysh, copper and lead near the river Turgai, and salt in many different parts.

The chief seat of the Russian government is at TASHKENT, and the numerous independent states which formerly occupied Central Asia have nearly all become subject to Russia, or remain independent only in name.

Vegetation is represented in the wilderness chiefly by the saxaul, the jidda or wild olive, the poplar, and other hardy or prickly plants, which have invaded this domain from all quarters since the subsidence of the waters.

In the cases the cultivated plants, both cereals and fruits, are noted especially for their great abundance and excellent quality. In Khiva wheat will yield sixty, rice seventy, and the *jagara* as much as three-hundredfold. This latter grain takes the place of oats, and its stalks are used for hay for horses and cattle. Barley, lentils, and peas are also cultivated, besides cotton, hemp, *kunshut* (a small-yielding fruit), madder, flax, and tobacco. The lack of grazing grounds is here obviated by the lucerne clover, which is sown three times a year, and yields excellent fodder. But the special glory of this oasis are its fruits, which are remarkable for their fine flavour. Here flourish choice apples, pears, plums, apricots, peaches, the grape, the pomegranate, and, above all, the melon. Of trees, the poplar, naran, and elm are grown for their timber, and the mulberry for the silkworm.

The mulberry, flax, and maize form the staple produce of Ferghana, which also grows fine crops of wheat, rice, sorghum, maize, cotton, and tobacco. In Semirechinsk fertile and well-watered upland valleys are succeeded by grassy steppes stretching away to the low-lying swampy shores of Balkhash. Higher up a splendid wooded zone clothes the slopes of the Zungarian Alatau, between 4500 and 8500 feet. In the forests of the Central Thian-Shan the prevailing trees are the mountain ash and the spruce (*Picea Schrenkiana*), which are now supplanting the apple and apricot. The spruce attains a height of 70 to 80 feet, with a thickness of stem 2, 3, and often 4 feet in diameter. The lowlands abound in scorpions and other reptiles, and above all in torturing mosquitoes and in locusts. Wild animals, such as the bear, tiger, ounce, and wolf, haunt the thickets of the swampy Oxus and Aral deltas. But the open desert is frequented only by swift gregarious animals, like the wild ass and gazelle.

The camel, horse, sheep, and cattle are everywhere the prevailing domestic animals. The Kirghiz horses are a hardy, active breed, which traverse distances of 40 to 50 miles at a stretch. But a far finer animal is the Turkoman horse, which possesses many of the best points of the Arab and English.

**Inhabitants.**—Under the influence of Russian govern-

ment, the old marauding habits of the natives of this region are now restrained, and the extension of means of communication and the influx of a Slav population are rapidly increasing cultivation and trade. The railways and highways, however, are made by the Russians generally more according to military than commercial advantages. For administrative purposes Russian Central Asia is divided into three provinces, that of Ferghana, which comprised formerly the Khanate of Khokan, Tashkend being now the capital; Zerafshan, comprising the former Khanate of Bokhara, with Samarcand as capital; and the Transcaspian province, comprising Khiva and all the eastern borderland of the Caspian up to the Oxus, and southwards to the Atrek, the boundary river of Persia.

The Aralo-Caspian basin is commonly supposed to be the exclusive home of the Turki race, from whom this region takes the name of Turkestan, or "Land of the Turk." But this statement is true only of the unarable but still inhabitable grassy upland and lowland steppes, whose first occupants seem to have been the nomad tribes of Turki stock, by whom they are still mainly inhabited. On the other hand, the arable tracts, especially in Khiva, Bokhara, and Ferghana, have apparently from prehistoric times been the joint home of men of Turki and Iranian blood. Here an incessant intermingling of the two races has been going on for ages, resulting in a profound modification of both types, now represented by every shade intermediate between the two extremes. A third element, entirely distinct from the Turki, and allied to, but not identical with the Iranian, is found in almost exclusive possession of the productive upland valleys of Ferghana, the Zerafshan, and the Oxus. To these highlanders has been given the collective name of Galeha, and these Galehas, whose true position seems to be intermediate between the Iranian and Indic branches of the Aryan family, are obviously allied to the Wakhs, Badakhshis, Siakh-Kash Kafirs, Chagamis, and other highland races holding the upland valleys on both sides of the Hindu-Kush.

To the primitive Galeha, Iranian, and Turki stocks are reducible all the numerous nations from time immemorial in possession of the Aralo-Caspian basin.

**History.**—Alexander the Great crossed Western Turkestan from the western termination of the Hindu-Kush by the sites of Balkh, Kurshi, and Samarcand, to the south-west curve of the Sir Daria, and appears to have found the region at least as populous and wealthy as at present, and occupied by a number of petty states virtually independent. After the death of Alexander, the Grecian dynasty of Bactria ruled the country as far north as the Aral till about 120 B.C. The Greek power north of Hindu-Kush was then subverted by Scythians from the east, who were in their turn expelled by the Parthians. In 569 the ambassadors of the younger Justinian found the most powerful of the Turkish tribes seated around the Altai, and Turkish hordes had pushed their encampments as far west as the Caspian. The first princes who inherited the power of Genghis Khan were Moguls, who ruled the country for a very long period.

In more modern times the first tidings of Khiva, and of Central Asia generally, was brought to Europe by some Cossack tribes, who, in one of their plundering forays, captured several Persians, who told them of a very rich and fertile state beyond the deserts. Allured by the prospect of abundant booty, the Cossack horsemen, on two or three occasions, made a long and rapid march across the deserts from the Caspian, and with some success at the outset; but on each occasion, when re-crossing the deserts with their plunder, they were overtaken by the Khivan cavalry, and were cut to pieces.

Peter the Great was the first Russian monarch to turn his attention to Khiva with an idea of conquest, but it was not until the present century, when the Khans of Khokan,

of Bokhara, and of Khiva had been mutually at war for some years, that, siding with Khiva, the Russians worked their way up the Jaxartes valley to Tashkend, and by the capture of this city in 1864 became virtually masters of the Khanate of Khokan. Here a nucleus of Russian administration, for what was now designated as "Russian Turkestan," was formed, and also a base for further operations. The famous old city of Samarcand, in Bokhara, once the capital of Timur's great and powerful empire, fell before the Russian advance in 1868, and this, with the surrounding country, was incorporated with Russian Turkestan in 1870 as the province of Zerafshan, from the river which flows through it. A further advance eastward was made in 1871, when—owing to events arising out of Yakub Beg's successful revolt against China, and the erection of a temporarily independent state known as Eastern Turkestan out of Chinese Tartary—Russia occupied that part of the Chinese province of Zungaria embracing Kuldja and the valley of the Ili. Ultimately, however, China overthrew Yakub Beg, recovered the territory ruled for a time by him, and in 1881 Russia had to hand back to the Celestials almost the whole of the Ili valley she had occupied.

**TURKEY.** See TURKISH EMPIRE.

**TURKEY** (*Meleagris*) is a genus of Game Birds (GALLINÆ), belonging to the family Phasianidæ, subfamily Meleagrinae. The head and upper neck are bare and wattled; the bill is shorter than the head, strong, compressed on the sides, and arched towards the tip; the cere is elongated into a loose pendulous round fleshy caruncle. A tuft of long black bristles, longest in the males, springs from the base of the neck and hangs down on the breast. The wings are short and rounded. The tail is broad and rounded, pendent in repose, but capable of being erected and spread out like a fan. The tarsi are robust, covered in front with broad scales, and armed with a short blunt spur; the anterior toes are united at the base by a membrane; the claws are short and slightly curved.

The Common Turkey (*Meleagris gallopavo*) is a native of North America, where it had been domesticated

black; the naked skin of the head and neck is livid blue, and the excrescences are purplish-red. The female is much smaller and less brilliant in plumage.

Turkeys are found in flocks of several hundreds in the woods, the adult males keeping by themselves, and the females and young associating together and avoiding the males, who are apt to attack and destroy the latter. Turkeys are polygamous; and during the breeding season the males display themselves before the females in exactly the same way as the domesticated birds, strutting about with their tails spread and erected, their wings drooping to the ground, their heads drawn back, and their wattles dilated, uttering at the same time that peculiar gobbling sound which must be familiar to all our readers. The whole demeanour of the bird under these circumstances betrays an almost convulsive state of excitement which, however, he seems to find so delightful, that in order to prolong it he will, if possible, destroy the eggs laid by the female so as to prevent her sitting, and thus removing herself from his attentions. The female accordingly always selects some secret place for the reception of her eggs; and those who keep turkeys are well aware that this tendency to lay in out-of-the-way places has not been eradicated in the hen turkey by domestication. The nest is generally a slight hollow in the ground, filled with withered leaves, in a dry and sheltered situation. The eggs are from ten to fifteen, white, with small reddish-yellow spots. Desperate fights take place among the males for the possession of the females.

Wild turkeys feed on all kinds of grain, seeds, fruits, grass, insects, and even young frogs and lizards. They seek their food and pass most of their time on the ground, but roost at night upon trees. They make considerable journeys from one part of the country to another in search of food. They run very swiftly, and trust mainly to this means of escape from danger. They are preyed on by many carnivorous mammals and birds, and are shot in great numbers for the table. Wild turkeys have now become rare in North America, except in thinly settled districts. They were brought to Europe in the early part of the sixteenth century, and have been naturalized in many parts of the world. Their English name is said to have been given under the idea that these birds were natives of Turkey. Flocks of wild turkeys are kept in some of the parks of gentlemen's seats in this country. The domesticated variety has degenerated in size, beauty, and flavour from its wild original. Several breeds have been established under cultivation, the most distinct of which are the Norfolk, which are small and hardy, dark black in colour, with the chickens black instead of being mottled all over with brownish-gray, as is general in the other breeds. The domestic turkey, though difficult to rear, is highly valued for its flesh and eggs. It thrives best on a dry, sandy soil. See POTT 1853.

The Ocellated Turkey (*Meleagris ocellata*) is a native of Central America. It is rather smaller than the common species, which it resembles in its habits, but is far more splendid in its tints. The general colour of the plumage of the body is a bronzed-green with each feather bordered with two lines, the first of which is black, and the outer one golden-bronze. The greater wing-coverts are bright chestnut, and the quills are beautifully variegated with black and white. The upper tail-coverts and the quill-feathers of the tail are brownish-gray, mottled and banded with black, but towards the extremity each of them exhibits a band of variable green and blue, bounded above and below by a strong black line, and beyond this the tip of the feather is of the most beautiful coppery or bronzed-golden colour, so that, as these feathers are arranged in four ranges one above the other, the whole tail exhibits four transverse rows of brilliant eye-like spots. The only other species is the Mexican Turkey (*Meleagris mexicana*), a native of Mexico and the table-lands of the



Common Turkey (*Meleagris gallopavo*).

by the natives before the discovery of that continent by Europeans. The turkey of our poultry-yards is descended from this species, but has degenerated under domestication. The turkey is still found wild in flocks in the woods of North America. The adult male measures about  $3\frac{1}{2}$  feet in length and 5 feet in expanse of wing, and weighs from 15 to 20 lbs. The general colour is copper-bronze, with green and metallic reflections, each feather with a velvet-black margin; the tail feathers are chestnut, barred with

**Rocky Mountains.** It closely resembles the common species in its plumage and habits.

**TURKEY BUZZARD or TURKEY VULTURE** (*Cathartes or Rhinogryphus aura*) is a species of Vulture (Vulturidæ), so named from the resemblance which it presents to a turkey, both in size and in the red naked skin of the head and neck.

This species is spread throughout South America and the southern portion of the United States. It is common in Jamaica and other West Indian Islands. Wilson describes it as gregarious, numbers roosting together on the limbs of large trees; they may be thus seen in flocks, spreading out their wings to catch the rising sun of a summer morning, and remaining in that posture for a considerable time. They are, he adds, often seen in companies, soaring at an immense height, particularly previous to a thunderstorm. Its habits, however, appear to vary with the locality, for in South America it is not seen in flocks. According to Darwin, "the turkey-buzzard is a solitary bird, or at most goes in pairs. It may at once be recognized at a long distance by its lofty soaring and most elegant flight. It is well known to be a true 'carrion-feeder.' On the west coast of Patagonia, among the thickly-wooded islets and broken land, it lives exclusively on what the sea throws up, and on the carcasses of dead seals; and wherever these animals are congregated on the rocks, there the vultures may be seen."

In Jamaica this bird is known by the name of John Crow. So valuable are its services in the removal of carrion and animal filth, that the legislature imposed a fine of £5 upon any one who destroyed it within a stated distance of the principal towns. Its ordinary food is carrion, but when hard pressed with hunger it will seize upon young fowls, rats, and snakes.

The turkey buzzard has not been known to breed north of New Jersey in any of the Atlantic states; on the Pacific coast, however, it extends as far north as Canada. These birds seek out the swampy solitudes, and, without forming any nest, deposit from two to four eggs in the stump of a hollow tree or log, on the mere fragments of rotten wood with which it is ordinarily strewn. Occasionally, in the Southern States, they have been known to make choice of the ruined chimney of a deserted house for this purpose. The eggs, which are described as being larger than those of a turkey, are yellowish-white, blotched irregularly with dark-brown or blackish spots, at the larger end chiefly. The male often attends while the female is sitting; and if not materially disturbed, they will continue to occupy the same place for several years in succession.

The turkey vulture is about  $2\frac{1}{2}$  feet in length. The head and upper part of the neck are naked, reddish, and wrinkled, with a few scattered hair-like feathers; the back of the head and of the neck is sooty black; the general colour of the plumage is glossy brownish-black, with green reflections.

**TURKISH or OTTOMAN EMPIRE, THE**, comprehending all the countries in which Turkish supremacy is directly or indirectly recognized, includes some of the fairest portions of the world, and several of its earliest and most celebrated seats of civilization. It is not so much a continuous dominion, as a mere aggregate of governments, often widely separated both by position and interest, and only accidentally united by having been the subjects of a common conquest. Its vast territories, consisting partly of mainland and partly of islands scattered over the bosom or along the shores of inland seas, are situated in three different quarters of the globe—viz. in the south-east of Europe, the west of Asia, and the north-east of Africa; and though scarcely admitting of being geographically defined as a common whole, they may be considered as bounded N. by the Black Sea, Roumania, and Servia; W. by the Adriatic, the Mediterranean, Tunis,

and the African Desert; S. by the desert, Soudan, Abyssinia, and the Gulf of Bab-el-Mandeb; E. by Independent Arabia, the Persian Gulf, and Persia; and N.E. by Transcaucasian Russia. After allowing for the deductions made by the treaty of Berlin and the Anglo-Turkish Convention, but reckoning the Turkish possessions in Africa, Turkish supremacy is still recognized, directly or indirectly, over 2,000,000 square miles, and by more than 40,000,000 people.

As the leading divisions of the empire form the subjects of separate articles, in which the more important details respecting them are given, we shall here only attempt a general description. To prevent confusion, the territories of each continent are presented under the separate heads.

The Turkish dominions in *Africa* consist of an immense tract of country facing the Mediterranean, from the frontiers of Tunis, and extending along the western shore of the Red Sea to the frontier of Abyssinia. Inland its boundaries are those of Tripoli, Fezzan, Barca, and Egypt. Tunis, though nominally subject to Turkey, is now a French dependency. The aggregate area is estimated at 1,550,000 square miles, the population at 18,500,000. A large part of the country is composed of sandy deserts in the partial occupation of wandering Arabs, though there are not wanting other regions which strikingly contrast with the general barrenness.

The Turkish dominions in this continent are described in the articles BARCA, EGYPT, FEZZAN, NUBIA, SUDAN, and TRIPOLI.

*Turkey in Asia*, taken in its widest sense, includes within its geographical limits the long belt of Arabia which lines the eastern shore of the Red Sea, but it is usually described as confined to that part of the Asiatic continent lying between  $31^{\circ}$  and  $42^{\circ}$  N. lat. and  $26^{\circ}$  and  $48^{\circ}$  E. lon. and bounded N. by the Black Sea, the Bosphorus or Straits of Constantinople, the Sea of Marmora, and the Hellespont or the Straits of the Dardanelles; W. by the Archipelago and the Mediterranean; S. by Arabia; and E. by the Persian Gulf, Persia, and Transcaucasian Russia. The space defined by these boundaries has an area of about 730,000 square miles, and a population estimated at about 16,000,000. When viewed in regard either to its physical features or the wonderful events of which several of its regions have at different periods been the theatre, this portion of the Turkish Empire possesses an almost unrivalled interest. It may properly be described as consisting of two plateaus and an extensive plain. The larger and more elevated of these plateaus occupies the whole of its northern portion, stretching across it from the shores of the Archipelago to the frontiers of Persia and Transcaucasian, and comprising within its limits the peninsula of Asia Minor, and the highlands of Armenia and Kurdistan. It has an average elevation of from 4000 to 5000 feet, and forms the base of two parallel mountain chains, the Taurus and the Anti-Taurus, which increase in height as they proceed towards the east, presenting many remarkable cones and peaks, several of which rise beyond the line of perpetual snow. The other plateau, that of Syria and Palestine, is also traversed by two parallel ranges, which, breaking off nearly at right angles to the Taurus, proceed south at no great distance from the shores of the Mediterranean, and are continued almost without interruption across Arabia Petrea and the peninsula of Sinai to the Red Sea. This plateau is less remarkable for its height than for the depression of one of its valleys, which, in the line of the Jordan, is more than 1300 feet beneath the level of the sea.

The extensive plain of Irak and Mesopotamia, forming the lower banks of the Euphrates and Tigris, is bounded on the N. by the Armenian, and on the W. by the Syrian plateau, and though now little better than a steppe, oftener

covered with sand than verdure, originally possessed attractions which marked it out for the cradle of the human race, and made it the earliest seat of empire. The drainage of this vast territory, divided into numerous basins by the mountains which traverse it, is carried to four different seas, of which the Persian Gulf receives the largest share by means of the Euphrates and Tigris already mentioned. The Black Sea receives its portion chiefly by the Yeshil and Kizil-Irmak, and the Sakareeyah; while the streams which flow into the Archipelago and the Mediterranean are, for the most part, only mountain torrents. The only lake deserving of notice for its magnitude is that of Van, in the east of Kurdistan, though, for other reasons, a far greater interest attaches to those of Tiberias and the Dead Sea in Palestine. The principal islands are Mitylene, Seio, Samos, Nicaria, Patmos, Cos, Rhodes, and Scarpanto. The island of Cyprus is nominally under Turkish suzerainty, but in reality under the entire control of Great Britain, which pays to the sultan annually a certain proportion of the revenue.

The soil and climate present many varieties: in the south are vast arid plains, but on the river banks and in the valleys of Lebanon the soil is extremely fertile. The summits of Taurus are clad with snow, and their flanks are covered with the vegetation of cold and temperate countries, while the valleys have a temperature almost tropical, and produce the fruits of South Asia. Many of the present arid parts of Turkey in Asia were kept in a state of great fertility in ancient times by means of irrigation, but during the wars which desolated the country for six centuries the canals were allowed to fall into decay, and have never since been repaired. The climate of Anatolia is temperate, and the soil is capable of producing all kinds of grain and fruit. The mountains contain all the useful metals. The chief products are oil, dye-stuffs, medicinal plants, gums, wax, dried fruits, gall-nuts, cotton, silk, wool, goat's hair, leeches, and sponge.

Throughout Asia Minor the great majority of the population consists of Turks, the ruling race, differing in nothing from their European brethren except in being more Asiatic in appearance and habits, while more ignorant and intolerant as Moslems. Under their misgovernment a region possessed of splendid natural resources, which flourished under successive Persian, Greek, and Roman masters, in spite of campaigns and battles, has had its fortunes sadly marred. The Turks, a branch of the same family as the Ottomans, who speak a kindred dialect, but retain the nomadic usages of their ancestors, are numerous on the high plains, where they live in tents during the summer, frequently shifting their camps in search of pasturage, and generally spend the winter in fixed villages. They possess large herds of camels, buffaloes, goats, and sheep, and breed horses for sale; while the women spin wool, and make carpets and articles of clothing. Each camp is under the government of a chief, and pays a tax to the pashas of the respective districts proportioned to the number of tents, for the privilege of pasturing their flocks and herds. While adhering to Mohammedanism, they have little acquaintance with its dogmas and precepts, and have no mosques or priests. The Turks are variously spread further east, over the high grounds of Armenia, the wavy downs of Upper Mesopotamia, and the northern plains of the Syrian Desert. See ASIA MINOR.

*Turkey in Europe*, the remaining portion of the Turkish Empire, is of very limited extent in comparison with its African and Asiatic possessions, but derives great importance from containing the seat of government, and from being more closely allied to great European interests. It formerly occupied nearly the whole of the south-east extremity of the Continent, from the frontiers of Austria and Russia southward to Cape Majapan. Gradually, however, the area of the sultan's European dominion has been

reduced, until it is now only about one-third of the extent over which it spread at the commencement of the century. GREECE, ROMANIA, SERBIA, and MONTENEGRO, instead of being portions of the Ottoman Empire, are now independent states, and will be found described in detail under their respective names. Bosnia and the Herzegovina, too, may doubtless be regarded as lost to Turkey, notwithstanding the fiction of their only being occupied by Austria; and of what remains a considerable portion is semi-independent of the Porte, the authority of the sultan therein being of the most fragile character. Turkey in Europe may be said to comprise a kind of irregular oblong, bounded on the N. by Roumania, Servia, Bosnia, and Montenegro; S. by Greece and the Ægean Sea; W. by the Adriatic; and E. by the Black Sea. The area now immediately dependent on Turkey in Europe is 63,850 square miles, with a population of about 4,500,000. Her supremacy is also acknowledged by Eastern Roumelia,\* with a population of 850,000 and an area of 13,500 square miles, and by Bulgaria with a population of 2,000,000 and an area of 24,370 square miles.

*Face of the Country, Mountains, &c.*—The interior of European Turkey, as thus defined (*i.e.* including the autonomous province of Eastern Roumelia), has for its principal superficial feature an extensive central nucleus of highlands and plateaus, under the meridian of 21 degrees, which culminate in the peak of Tchar-dagh, covered with snow nearly all the year; and form a kind of mountain-knot, from which various ranges diverge in different directions. North-westward stretch the Dinaric Alps, which join the great Alpine system of Europe. Eastward the chain of the Balkan, ancient *Hæmus*, extends to the bold headland of Cape Emeneh, on the shore of the Black Sea. South-eastward a loftier ridge, the Despotodagh, runs into the plains which border the north coasts of the Archipelago. Southward the range of Pindus follows the direction of the peninsula into Greece, of which the classical mountains Olympus, Pelion, and Ossa are offshoots on the Gulf of Salonica. These chains, to a considerable extent, render communication between contiguous provinces rare and difficult in a country where, owing to the apathy of the present inhabitants, art has not been employed to soften the features of nature; and where the engineering works of the ancient masters—Greek and Roman—have suffered largely from the ravages of war as well as from the dilapidations of time, with scarcely an effort to repair them. The only route across the Balkan to which the Turks paid serious attention was on the line of communication between Constantinople and Vienna, which bears the name of *Porta Trajani*, in memory of the emperor who rendered the pass a practicable thoroughfare. A few of the Turkish mountains attain the elevation of from 9000 to near 10,000 feet, as Olympus, the loftiest, 9754 feet; but they are generally much below that altitude.

The Balkan Mountains were always considered by the Turks of great importance as a line of military defence in the event of invasion from the north. They form an undulating range separating Roumelia from Bulgaria; and the waters which flow to the Archipelago from those which fall into the Danube. Their height gradually diminishes from west to east, until towards the Black Sea it is inconsiderable. In the opposite direction it rarely exceeds 4000 feet. Mount Merrikon, the culminating point, rises 6395 feet, and does not lose its snow at the summit till the summer is somewhat advanced. The tops and sides of the chain are clothed with thick woods through almost the whole of its course, and it is only along the declivities of valleys and gorges that any extent of bare rock appears. A range of hills along the base, intersected with ravines, is also so densely covered with brushwood as to be scarcely penetrable. The difficulty of leading an invading army across these mountains is not owing to the

height of the passes; the forests are the chief obstacles, with the want of roads better than the rudest mule-paths; but these difficulties, though only after great sufferings, the Russian invaders have on several occasions successfully overcome.

**Geology and Minerals.**—The geology of the country has not been fully or accurately explored. Primary fossiliferous strata occur only in isolated spots, and that part of the secondary formation in which the coal measures are usually found is believed to be altogether wanting. The upper part of the secondary formation, including the cretaceous system, is very largely developed; the limestones, sandstones, and other rocks belonging to it, compose almost the entire stratification of extensive tracts, particularly in the west. Tertiary formations also prevail both in the east and in the basin of the Danube; and along almost all the large rivers, and at their mouths, alluvial deposits of greater or less thickness are usually found. Crystalline schists, composed of gneiss and mica, and chlorite slates are, if not the most largely, the most conspicuously developed of all the rocks, inasmuch as they form the great bulk of the loftiest mountain chains. In connection with the schists, granite also is of frequent occurrence, and is sometimes seen piercing the gneiss at high elevations. No evidence of active volcanic agency anywhere appears; but the important part which it must have performed in giving the country its final configuration is indicated, both by the existence of thermal springs, and by the masses of trachyte and other volcanic products which cap some of the summits both of the Despoti and the Tchar-dagh. Many of the veins which traverse the crystalline schists have been ascertained to be highly metalliferous; and lead, yielding a considerable percentage of silver, has at different periods been actually worked. Iron also, of the best quality, is very abundant; but neither the government nor the people seem as yet inclined to turn their mineral treasures to good account.

**Rivers.**—The number and irregularity of the greater and minor mountain ranges render the system of drainage very complicated, dividing it into four principal, together with a great number of subordinate basins. The most important is that of the Black Sea, into which the Danube—augmented on the right by the Save, with its tributaries Unna, Verbas, and Drin; by the Isker, Vid, and Osma; and on the left by various streams not now in Turkish territories—pours the accumulated waters of Bulgaria. Next in importance is the basin of the Archipelago, which receives the Salembria from Tlessaly, the Indje Kara-soo, Vardar, and Struma (Kara-soo) from Macedonia, and the Maritza from Roumelia. The Adriatic and Ionian seas, properly regarded as only one basin, wash a large extent of the Turkish coast, but owing to the proximity of the mountain chains receive from it no rivers deserving of notice, except the comparatively insignificant Allman Drin, Scambi, and Vogatza. The fourth basin, the Sea of Marmora, receives only a few mountain torrents. Considering the mountainous character of the country, and its numerous perennial streams fed from snowy heights, it is remarkable that Turkey in Europe does not possess a single lake worthy of the name, with the exception of those of Ochrida in the east, and of Scutari in the north-west of Albania.

**Climate.**—The climate is more severe than might be supposed from the geographical position of the country. The Danube regularly freezes, and in the recesses of the highest mountains snow lies during the greater part of the year. It is excessively cold in winter during north-east winds, which are then prevalent. The olive will not grow in the latitudes which in Spain and Italy are found to be most congenial to it, and much harder plants are often nipped by keen frosts after the season has considerably advanced. On the other hand, a great portion of Albania, protected by elevated mountains from the north-east winds,

enjoys a delicious climate. Even in the more exposed districts the vintage becomes general before the end of July. No part of the world is better adapted to the production of the ordinary cereals; and the grain at present raised clearly indicates the immense quantities which, under better circumstances, might easily be produced. In the rocky districts of the interior and in the maritime valleys of Albania the summer is insupportably hot. Devastating storms are frequent in the south, and Albania is liable to be visited by destructive earthquakes.

**Vegetation, Agriculture, &c.**—On the southern slopes of the Balkans there are whole forests of apple, pear, cherry, and apricot trees, with the oak, beech, lime, and ash; while the lower lands are clothed with the almond, walnut, chestnut, maple, and mulberry, cypresses, and sycamores of enormous dimensions, besides the myrtle, laurel, box, and other evergreens. In spring the surface is gay with flowers, among which the narcissus, violet, and hyacinth appear in profusion, with gardens of roses, jasmine, and wild lilac. In the extreme south the olive becomes the most common fruit-tree, while the orange and fig are abundant. The vine is cultivated generally, the most choice grapes being grown on the coasts of the Archipelago. In the north the plum takes its place, and a favourite beverage, *slivovitz*, is made from its juice. Melons, cucumbers, pease, beans, and cabbages, which form a principal part of the ordinary food of the Turks, are raised in great quantities; but some of our common vegetables are scarcely known, and the potato has a very restricted cultivation. The grain crops—maize, wheat, rye, barley, and millet—are sufficiently abundant, not only for the home demand, but for exportation, and ten times the produce might be gained by skillful husbandry. Roumelia is one great garden, in which, however, the weeds contend with the fruits of the earth for the mastery. Rice is grown in the southern provinces, where there are marshy tracts of limited extent, but the supply being insufficient for home consumption, this is the only grain which is imported. Tobacco, flax, hemp, cotton, and silk are other products of the soil. Both agriculture and horticulture are everywhere in a very backward state, the implements being of the rudest description, while the long unsettled state of society has so far checked industrial efforts, that a vast proportion of the surface is not brought under any kind of cultivation. Herds of oxen, flocks of sheep and goats, with bees producing large quantities of wax and honey, constitute occasional sources of wealth to the inhabitants.

**Animals.**—The principal wild animals are the brown bear, found in the wooded mountains between Albania and Macedonia, Bosnia, and the Lower Rhodope, but seldom in the Balkans; the wolf is common; the wild boar, chamois, and stag abound in the forests. The domestic animals comprise the dog, cat, hog, and sheep. Goats are more abundant in Turkey than in any other country of Europe. Cattle are extensively reared, and the buffalo is common in Roumelia and Thrace. The horse of Turkey is small, but active; the ass and mule are chiefly employed in Thrace. Trout, &c., are plentiful in the rivers; and beeches, which abound in the marshes, form an important article of export.

**Manufactures.**—The manufactures are almost entirely domestic, comprising saddles, copper and tin utensils, firearms, swords, coarse woollen cloths, and linen and cotton spinning; silks are manufactured chiefly at Salonika and Seres. Carpets wrought by hand, in the style of the Gobelins tapestry, are extensively manufactured in Bulgaria. The manufacture of cotton goods, at one time the staple branch of industry, carried on to a greater or less extent in almost every town, village, and hamlet, has nearly ceased to exist, from its inability to compete with the products of the power-looms of Great Britain. Embroidery is carried on by females in the south provinces. Tanneries, in which some of the finest kinds of leather are



made, are numerous; and distilleries of brandy from prunes are common throughout the country. Filigree work is made in the large towns, and there are powder mills near Constantinople.

**Population.**—There is some evidence that on the eventful 29th of May, 1453, when Sultan Mohammed II. planted the standard of the Prophet on the walls of Constantinople, the total number of Osmanli in Europe did not exceed three quarters of a million. What was the number of the conquered (significantly called by the victorious Osmanli the *Rayahs* or the herd) can only be the subject of the vaguest guesses. Vast crowds fled before the approach of the Turks; but during the comparatively tolerant rule of Mohammed II. and his successor, Bayazid II., a great many Greek families returned to the capital and seaport towns, and some re-immigration is also reported to have occurred in the Slavonic provinces of the north. It is stated by a French writer that in the reign of Solymán II., surnamed the Magnificent, when the fame and power of the conquering Osmanli reached its zenith, the population of European Turkey amounted to 12,000,000; but this is an altogether unsupported account, and undoubtedly exaggerated. However, what appears certain is, that from the taking of Constantinople for at least two centuries onwards the Christian population of Turkey steadily increased, so much as to cause great alarm to the ruling tribe. Again and again successive sultans and their advisers deliberated in all solemnity on the question of keeping down the too fast increasing *Rayah* population by a general massacre, which was only prevented on one or two occasions by the merest accident, and more generally by the fear that extermination might be a dangerous process. Instead of it, the easier policy of making proselytes to the religious creed of the conquerors by all possible means, thereby increasing the number of Moslems, and correspondingly weakening the *Rayah* element, was adopted with great zeal and not a little success. In Bosnia and Bulgaria notably almost the entire aristocracy, or the land-owning class, were early brought to adopt the religion of Mohammed, as the only escape from intolerable oppression. These Christian converts have earned the repute of being fiercer tyrants than the true Osmanli, ever acting always as the implacable enemies of their own race.

It is now often stated that the Mohammedan population of the Turkish Empire is fast declining, but such statements should be received with caution. The malarious fevers of the country often cause inhabitants to desert their former homes and migrate to a more healthy locality. A large accession of population has taken place in Asia Minor, owing to the immigration of Moslem refugees from Bulgaria and Eastern Roumelia.

**Constitution, Government, Religion, &c.**—The fundamental laws of the empire are based on the precepts of the Koran. The will of the sultan is absolute, in so far as it is not opposed to the accepted principles of the Mohammedan religion, as laid down in the sacred book of the Prophet. Next to the Koran the laws of the *Mulkah*, a code formed of the supposed sayings and opinions of Mohammed, and the sentences and decisions of his immediate successors, are binding upon the sovereign as well as his subjects. Another code of laws, the "*kanun nameh*," formed by Sultan Solymán the Magnificent from a collection of *hatti-sherifs* or decrees issued by him and his predecessors, is held in general obedience, but merely as an emanation of human authority. The Koran and the *Mulkah* alone, both believed to be of divine origin, embody the fundamental laws of the state, and prescribe the action of the theocratic government.

The legislative and executive authority is exercised under the supreme direction of the sultan, by two high dignitaries, the grand vizir, the head of the temporal government, and the sheik-ul-islam, the head of the

church. Both are appointed by the sovereign, the latter with the nominal concurrence of the Ulema, a body comprising the clergy and chief functionaries of the law, over which the sheik-ul-islam presides, although he himself exercises neither priestly nor judicial functions. Connected with the Ulema are the Mufti, the interpreters of the Koran. The Koran is still the only unquestionable recognized source of civil and religious law, and the Mufti, its interpreter, is the supreme authority with regard to the legality of all religious, civil, and political acts. His subordinates, the sheik-ul-islam *Kiayari* and separate muftis for daily affairs, for legal and ecclesiastical decrees, form his council. To them even the sultan himself refers in every act of importance. He does not declare war nor conclude peace till he has asked the Mufti and his Ulema or wise men whether it is conformable to the law, and the Mufti decides by a decree or *fatwa*. A similar process must be gone through by the successful leaders of a rebellion to justify the deposition of a sultan. The Ulema comprise all the great judges, theologians, and jurists, all the great teachers of literature and science, who may be summoned by the Mufti.

The temporal administration comprises three classes of dignities of the pen:—1. The Sublime Porte of the grand vizir, who presides over the state council with three ministers, for home and for foreign affairs and for executive acts, with six under secretaries, the most important of whom is Kanunji, or minister for reversion of decrees, who is supposed to be answerable that all acts of the ministers are conformable to the law of the Koran. 2. The Porte of the Defterdar, or minister of finance, comprising sundry ministers in various branches of finance, keepers of the seal, who are styled vizirs, and whose council is known as the Divan. 3. The *Azhar*, comprising a number of civil and military officers of state of a special dignity, or in close relation to the sultan's person. The "dignities of the sword" comprise viceregal and provincial governors, pashas, and boys. The pashas are at once military and civil commanders, judges, and receivers of taxes, the latter being accounted for in an infinite variety of fashions. Sometimes the pasha is only receiver-general, sometimes only farmer-general; the only invariable feature of the system being the endless variety of openings it affords for corruption, oppression, and maladministration.

The grand vizir, as head of the government and representative of the sovereign, is president of the Divan or ministerial council, divided into nine departments, namely, foreign affairs, war, finance, marine, commerce, agriculture, and public works; police, justice, public instruction, and "*vakouf*," or of the domains of the church and of ecclesiastical institutions.

The empire is divided into governments, and subdivided into provinces and districts. A general governor or pasha, who is held to represent the sultan, and is assisted by a council, is placed at the head of each government. The provinces and districts are subjected to inferior authorities under the superintendence of the principal governor. Formerly these provincial governors had the power of life and death in their hands, and they have still the opportunity of practising extortion to an almost ruinous extent, especially in the more remote districts. All subjects, however humble their origin, are eligible to, and may fill the highest offices in the state. Birth confers no privilege, as all true believers are equal in the eye of the law.

By the law of succession obeyed in the reigning family the crown is inherited, according to seniority, by the male descendants of Osman sprung from the imperial harem. The harem is considered a permanent state institution, and all children born therein, whether offspring of free women or of slaves, are legitimate and of equal lineage; but the sultan is succeeded by his eldest son only in case there are no uncles or consins of greater age.

It has not been the custom of the sultans of Turkey for some centuries to contract regular marriages. The inmates of the harem come, by purchase or free will, mostly from districts beyond the limits of the empire—the majority from Circassia. The superintendent of the harem, an aged "lady of the palace," keeps up intercourse with the outer world through the guard of eunuchs, whose chief has the same rank as the grand vizir. The civil list of the sultan is not known, but though it is estimated at from £1,000,000 to £2,000,000, the expenses of the court and harem are said greatly to exceed it.

Throughout Turkey the ministers of religion are subordinate to the civil authorities, who exercise over them the power of diocesan. Magistrates may supersede and remove clergymen who misconduct themselves, or who are unequal to the proper discharge of the duties of their office. The magistrates themselves may also, whenever they think proper, perform all the sacerdotal functions. Owing to the fact that the Koran constitutes the code of law and charter of rights, as well as the religious guide of the followers of Mohammed, there is a close connection between the ministers of religion and the professors and interpreters of the law. Both together form the class of Ulema, governed by the sheik-ul-islam, the former being called Mollais and the latter Muftis. The members of the Ulema go through the same course of education, based on a thorough knowledge of the Koran and the Malteka; but though they all study together the lawyers and judges are quite distinct from the clergy, every young man brought up in one of the colleges of the order being allowed to determine for himself, when he has acquired a sufficient stock of learning, whether he will become a priest, or a doctor of law, or a judge.

The members of the Ulema constitute a form of aristocracy. They pay no taxes or public imposts, and by a peculiar privilege their property is hereditary in their families, and is not liable to arbitrary confiscations. Their persons are sacred; their blood may on no account be shed; nor can they be legally punished in any way but by imprisonment and exile. However, the power and dignity of the Ulemas are not hereditary in individuals, but in the order. Formerly they held their offices for life, but about the end of the seventeenth century they were made removable at pleasure, like other public functionaries. Each individual, however, enjoys all the privileges of the order, independently of his holding any office or exercising any public employment. Besides the Ulema there is a priestly class limited to the descendants of Mohammed by his daughter Fatima. These are called Oomra or Ameeris, and are authorized to wear green turbans. They are very numerous, and are found in the lowest ranks of life.

In common with all Mohammedans the Turks compute from the time of the Hégira, or the flight of the Prophet from Mecca, on Friday, the 16th of July, 622. Their year consists of twelve lunar months, and is consequently shorter than the Christian one. They observe with the utmost strictness the month of RAMADAN as a prescribed annual fast, during which, from sunrise to sunset, no one eats, drinks, or smokes. The obligation is imposed on all but children and invalids. Owing to the lunar reckoning this month runs through every season in the course of thirty-three years, and when it occurs in the midst of summer the labouring classes suffer extremely from exhaustion and thirst, for not even a draught of water is taken. But at the sunset hour, a moment anxiously expected, and generally announced by the firing of cannon, all classes make up for abstinence through the day by revelry through the night. The streets are crowded and the coffee-houses thronged. The mosques are open and the minarets illuminated. Attached as functionaries to the principal mosques are imams, sheiks, and kiatibs, who are the Friday preachers; the muezzins, or those who call to

prayer; the dewr Khuran, readers of the Koran; the maatshuran, singers of hymns; the rewab, door-keepers, and other inferior officers.

The Koran and Malteka encourage public education, and, as a consequence, public schools have long been established in most considerable Turkish towns, while medresses or colleges with public libraries are attached to the greater number of the principal mosques. The instruction afforded, however, is somewhat limited. A law of public education was passed in 1869 providing for the establishment of primary, preparatory, and special schools, but no attempt has ever been made to execute it.

*Revenue and Expenditure.*—The revenue of Turkey is chiefly derived from taxes of three denominations, the vergi, the aashir, and the roussoumiat. The vergi or poll tax is a tax on the whole population, paid at a fixed rate for each house or family. The second tax, the aashir or tithe, is a tax of 10 per cent. (nominally) upon the produce of cultivation. The third tax, the roussoumiat, is revenue derived from the farming of the customs, stamps, the sale of animals, taxes on shops, bakeries, butcheries, and mills, and from the rent of lands belonging to the crown.

The financial affairs of the Ottoman Empire have been in a state of thorough disorganization, but since 1880 a certain amount of improvement is visible. Although the figures in the budget which were allowed to transpire tended to show a large deficit, variously estimated at from £1,000,000 to £8,000,000 sterling, yet since November, 1880, the Porte has issued no loan and received no permanent advance, with the exception of some £200,000 during the Egyptian crisis of 1882. There is therefore a paper deficit. Ottoman financiers have restored the balance of the budget by reducing the pay of both civil and military functionaries far below the amounts which figure in the budgets, and by withholding it in part or entirely. In 1883 the gross revenue was estimated at £13,686,000, and the expenditure at £14,089,000. In July, 1881, delegates from the bondholders of England, France, Austria, Germany, and Italy met at Constantinople, and effected an arrangement of the debt, which was embodied in the imperial decree of December 8/20, 1881, and by which the debt was reduced to £106,437,231. The government agreed to hand over to a commission, consisting of delegates appointed by the bondholders from the different countries of Europe, the excise revenues of Turkey, to be administered by them, entirely separate from the other government administrations. The Galata bankers acquiescing in this arrangement, became first mortgagees, and their debt became more marketable. The nominal amount of the loans made by them to the Porte was consolidated into a privileged debt of £8,170,000, and an annual sum was set aside for the service of this debt to form a first charge on the conceded revenue. The first few years of this arrangement have passed satisfactorily for those interested in it. The council of administration took over the revenues at the commencement of 1882, and has been in peaceful possession of them ever since. Since 1882 interest has been paid at the rate of 1 per cent. per annum on the reduced capital value. Of the other loans, those of 1851 and 1871 are secured on the Egyptian tribute, and that of 1855 is guaranteed by France and England.

An important step was taken by the Turkish government in 1881. Formerly each department had the power of paying its debts, without any reference to a central authority, in orders (*huralia*) on provincial governors, the discount at which these orders were issued depending on the credit which the particular department issuing them enjoyed at the moment. The central authority was always misinformed in its calculation as to how much revenue would come in. This system of orders was abolished. Each department makes known its wants to the central authority, and all payments are made by the central authority only.



*Means of Communication, &c.*—In 1887 some progress had been made in the construction of highways, and in Europe and Asia there were altogether 1251 miles of railway open for traffic, of which 904 were in Europe. At the same time there were 14,617 miles of telegraph lines.

*Army and Navy.*—Military service is compulsory on all able-bodied Mohammedans who have reached the age of eighteen; the men are drawn by ballot, about 45,000 recruits being taken each year. Substitution is allowed on payment of a sum of about £50, and sole supporters of families are exempt. Non-Mohammedans are not liable to military service, but have to pay an exemption tax, about 6s. per head per annum, levied alike on males of all ages. According to the existing system (reforms proposed by German officers not having been yet introduced), the army consists of the Nizam or regular army, two bans of Redif or Landwehr, and the Mustahfiz or Landsturm. The period of service is twenty years—viz. three years for infantry, and four for the other arms in the Nizam; three and two years in the Nizam Reserve (Itkhtiyat); four years in each ban of the Redif; and six years in the Mustahfiz. The permanent army comprises 264 battalions of infantry, 189 squadrons of cavalry, 104 batteries of field artillery, 36 batteries mountain, and 29 battalions garrison artillery, 4 battalions infantry train, 11 battalions of artificers, 3 battalions fire brigade, 22 companies of engineers, 2 sanitary companies, and 1 telegraph company, with a total numerical force of 9810 officers and 149,312 men. The infantry is armed throughout with the American Peabody-Martini rifle, and repeating rifles are being introduced. The Turkish field artillery is well supplied with Krupp guns, the mountain artillery with Whitworth guns. To this force in time of war would be added the Itkhtiyat or First Active Reserve, amounting to about 40,000 men, who would be drafted into the regular or Nizam regiments; also 192 battalions of the first ban of Redif, say 131,100 men, to be, if necessary, supplemented by 160 battalions of the second ban, or say 112,000 men. This would give a total war strength of 445,122 men, without resorting to the Mustahfiz or Landsturm, which might perhaps give a further strength of 120,000. Properly trained and officered the Turks make most excellent soldiers, bearing patiently the extreme hardships, and fighting with the coolest disregard of danger and death. The forces are armed with the most approved modern weapons.

In 1877, under pressure of the urgent necessity created by the war, Christians were intrusted with arms. In that year, under the theory of reorganization, nearly 700,000 soldiers ought to have been available; but to meet the Russians both in Asia and in Europe, the Turks could only muster about half the number mentioned.

The fleet of war of the Turks was considerably reduced by the sale of some of its best ships to England. In 1887 it consisted of fifteen large armour-clad ships, besides a few smaller ironclads, including monitors and gunboats, and several other steamers, many of them old-fashioned, and three completed torpedo boats. The fifteen large armour-clad ships comprise three of the first-class, or sea going frigates; four of the second class, or sea going corvettes; and eight of the third class, or corvettes for coast defence. The *personnel* available is said to be about 40,000 men, enlisted by conscription, and serving for eight years.

*Trade and Commerce.*—It is evident that a country possessed of so many valuable products, and in consequence both of its position and the extent of its coasts and inland seas accessible at so many points, either from west or east, must, under any circumstances, command an extensive traffic. Commerce, however, is much restricted by the difficulty of land transit and misgovernment. Commercial treaties have been concluded on a liberal scale between Turkey and several European powers, and the

system of bonded warehouses has been established in Constantinople and other large towns. The commercial intercourse between the United Kingdom and the Turkish Empire in 1884-86 is shown in the annexed table:—

Year.	Imports into the United Kingdom from Turkey.	Exports of Home Produce from the United Kingdom to Turkey.
	£	£
1884	5,460,204	6,393,568
1885	4,680,637	6,132,795
1886	4,117,039	5,901,169

These figures refer only to the European and Asiatic Turkish dominions, and do not include the trade between Great Britain and Egypt.

The chief articles of export of the Turks to the United Kingdom are corn, wool, goats' hair, valonia, raisins, and opium. By far the most important imports into the Turkish Empire from the United Kingdom are manufactured cotton and cotton yarns.

It is estimated that the total trade of the Turks with foreign countries and the provinces is worth about £70,000,000 per annum. In the order of importance the countries which trade with the Turkish Empire are Persia, Great Britain, France, Austria, Russia, and Egypt, the principal commercial ports being Constantinople, Trebizond, and Smyrna. The exports consist chiefly of the surplus of the articles produced and manufactures already noticed, and the imports include nearly every variety of manufactured article, but more especially cotton goods, glass, pottery, arms, paper, cutlery, &c.

*Habits and Customs.*—The population of the Turkish Empire embraces a considerable number of inhabitants of Slavonic origin, speaking various dialects, and of Greeks, numerous on the shores of the Bosphorus, the Archipelago, and in the islands. These races compose the greater part of the Christian subjects, who were cruelly oppressed in past times, and who are not yet free from heavy grievances in the districts still under direct Turkish rule. They are mostly members of the Greek Church, in connection with the great see of Constantinople, the bishops of which rose to pre-eminence in the Oriental world by favour of the early Greek emperors; assumed the style of patriarchs; took precedence of the older dignitaries of Antioch and Alexandria; disputed the pretensions of the Roman pontiffs to superiority; and, finally, renounced communion with them, constituting themselves the independent spiritual heads of Eastern Christendom. The Greek Church differs from the Latin in a multitude of particulars, doctrinal and ritual, yet they are chiefly of a very trifling nature; while it maintains as strongly complete submission on the part of the laity to the priesthood. The papas or priests are very commonly illiterate men, raised from the inferior ranks of life, who secure blind devotion from the ignorant masses, but often contribute to infidelity among the intelligent. Though persecution on religious grounds is prohibited, and impartial toleration is allowed to all classes, yet the government is too weak to restrain provincial officials and secure obedience to its decrees at a distance from the capital. Hence insults and outrages are not uncommon, offered by a bigoted and fanatical Mohammedan party, of the old school, to their neighbours of a different faith. The dominant race of Turks or Osmanli are probably over-estimated at 2,000,000, and are said to be decreasing in numbers. They live in and around Constantinople, are scattered generally through Roumelia, and are found to a less extent in most of the other towns.

The Turks belong to the great family of nations thinly

spread over the plains and table-lands of Central and Western Asia, known by a variety of names, but often comprehended under the general appellation of Tartars, pastoral in their occupations, and nomadic in their mode of life. They differ in personal lineaments from the more eastern tribes of the same stock, and correspond to the European type, as the consequence of change of circumstances, settled habits, and marriage alliances with females from the Caucasus. Their language is identical with the Arabic in its alphabet, but has a few additional letters; and the vocabulary is interlarded with many foreign words. It is easy to speak, but difficult to read, the vowels being generally omitted in writing and printing, while no marks of punctuation are observed. The national costume is loose and flowing. That of the women differs but little from that of the men, with the exception of the white veil worn by the former in public, and the turban of the latter. But among the higher classes in the capital, the turban has been largely discarded for the round fez-cap, and tight fitting clothes have been substituted for flowing robes. The houses are uniformly low, built of wood and sun-dried bricks, often painted over on the outside, with little furniture in the interiors, as chairs, tables, and bedsteads are alike dispensed with. Rice, fruits, coffee, and sherbet are the principal articles of food; baths and coffee-houses are the chief places of recreation; chess and draughts are the popular games; smoking is the universal habit. The Turks have a respectable literature, consisting of translated and original, poetical and historical compositions, in manuscript and print. But letters are only cultivated to a limited extent, chiefly by the class intended for government employment, or for the purpose of expounding the Koran; and the general ignorance in high-life is profound in relation to topics of ordinary knowledge with the humblest grades among the Western nations. In religion they are all Mohammedans, faithful to their creed, and attentive to the prescribed ritual of fasts, ablutions, and quinquuple daily prayers. While allowed four wives by the law of the Prophet, this license is now almost entirely restricted to the palaces of the rich and great.

The views expressed respecting the moral character of the Turks were once uniformly to their disadvantage, and scarcely allowed them the possession of a single virtue. But a more intimate acquaintance, the growth of the present century, has tended favourably to modify the general judgment; and perhaps their own fallen political fortunes has contributed to this result, by depriving them of the opportunity and the means to indulge in the fiery intolerance and licentious excesses of their conquering forefathers. They are undoubtedly a proud, sensual, phlegmatic, and indolent race, yet capable of vigorous exertion in great emergencies; and when tried by the events of the battlefield or the siege, they are never wanting in bravery. The men who at Plevna in 1877 turned an open village into an impregnable fortress, and held it with invincible tenacity against the thrice-repeated assaults of the Russian army, can never be reproached with want of courage. The wild fanaticism of their fathers may not now be so conspicuous, but the Turks still fight valiantly for their faith; and, buoyed up with the certain hope of passing over Al Serat, the hair bridge, direct into Jannat Aden—the abodes of eternal delight—the O-mani reckons his life as nothing when pitted against the rewards with which he shall be paid for its temporary loss. Though not easily provoked to anger, owing to an apathetic temperament, yet when once thoroughly roused, their passions are furious and resentments deadly. On the other hand, temperance must be ascribed to them, both as respects food and drink, the salutary effect of which is seen in a healthy, robust, and manly appearance. Travellers have frequently had occasion to remark upon their hospitality, honesty, and truthfulness;

and humanity to animals is a graceful characteristic. The beasts of burden, horses and camels, are lightly laden, and kindly treated, being very rarely urged by any instrument of punishment. Those who have the means will buy captive birds of the bird-catchers for the mere pleasure of setting them at liberty; and purchase scraps from the *jiguerjis*, vendors of cats' and dogs' meat, in order to feed the animals in the streets. Great reciprocal affection subsists between mothers and children in families, tender in the one, respectful in the other, constant and indissoluble in both.

Among the Semitic races the first place is due to the Arabs, who, not confined to their native Arabia, form a considerable element in the population of Syria, Palestine, and the lower basin of the Euphrates, and constitute a great majority in Egypt. More or less allied to them are the Maronites and Druses in Lebanon, and the Jebel-Haoran (Hauran), the Motualis in Cœle-Syria, the Ansariel or Nossairi in North Syria, the Nestorians or Chaldeans in the highlands of Kurdistan and Mesopotamia, and the Jews who are scattered over all parts of the empire, but have their favourite seats in Syria and Palestine.

To the Caucasian stock belong the Armenians, who, besides forming at least a third of the population in their native Armenia, are diffused as traders throughout all the larger towns; the Mohammedan Kurds, apparently Persian, though their language bespeaks a very mixed origin; the Yezidis, chiefly inhabiting the Sindjar Mountains, in the north of Mesopotamia; the Greeks, forming the bulk of the population in Asia Minor, Thessaly, Macedonia, and the islands, and constituting, to a very considerable extent, the mercantile and trading community of Turkey, more especially in the seaports; the Arnauts in the south, and towards the coasts of Albania; and lastly, the races of Slavonic origin, confined exclusively to the European part of the empire, but so numerous as to form almost the entire population of the territories between the Balkan and the Danube, amounting, under the name of Bulgarian Slavs, to about 3,000,000 in Bulgaria and Eastern Roumelia, and under the name of Serbs, to upwards of 1,000,000, principally in Albania and the districts adjacent to Servia.

*History of the Turkish Empire.*—The ancient Persians divided the world into *Iran*, the home of culture and of light, and *Turan*, the land of ignorance and of darkness. From Turan came those non-Aryan races, which we consequently denominate Turanian, and which are much further from us than the noble Saracen or the learned Hindu. The latter have in many cases joined the progressive civilization of the world, the Turanians are still strangers to it. Of all Turanian peoples the Turks are now so far beyond the rest in power and advancement, that they seem scarcely of the same race with the yet savage Turkomans of the desert. Yet, when the Turk conquered the Saracen and adopted the religion and much of the language of his victims, it was a distinct step backward in the history of the world. Centuries have elapsed. The Moors of Spain, the Saracens of Southern France and of Italy, are as good Spaniards, Frenchmen, and Italians as the rest of those nations, and antiquaries alone can distinguish in them the Saracen type; but the Ottoman Turks, after over five centuries, hold, as it were, but an entrenched camp amidst an alien race; they are felt to be intruders now almost as much as when, in 1453, they first took Constantinople, and were it not for the fear of the awful strife which the mad jealousies of European nations would plunge them into, in the case of the fair lands of the ancient Greek Empire being left open to the spoiler and the intriguer, the Turk would long since have been dismissed bag and baggage. By the help of European renegades who take service with him, and whose Turkish names and titles disguise their

true nationality, the Turk manages to carry on the semblance of a government, but it is scarcely more than the galvanizing of a corpse, and the first feasible solution of the Eastern Question which offers itself will see the happy end of his rule.

We observe, in times long past, the vigour of the youth of the Turkish dominion; the rigid despotism, when the despot knew his mind, flashing through the whole host and making it move as one man; the fatalism of his adopted creed nerving the warrior to desperate deeds, secure if his hour was not yet come; polygamy, while captives were plentiful, giving ready means of quick increase to the sword arms of the tribes. But decrepit is the age of such a nation. We observe in our own days the despot, in whose hands all the reins of the state are gathered, hold them with a nerveless grasp; we see the fatalist powerless against the threatenings of misfortune; we see the harems of the rich kept up by the enforced celibacy of the poor. The power to plunder is exhausted, while the power to produce has never grown up. The land groans under the heavy burden of the Turk: there is no possibility of improvement.

1. *The Seljuk Turks.*—The Turks appear first in history as captives and slaves. The course of conquest of the Omayyad (Saracen) caliphs led them, in 710, across the Oxus, and some Turkish slaves were brought in. These fierce men were thought to make a good bodyguard, and succeeding caliphs relied upon them, and multiplied their force, till they adopted the methods of the Prætorian guard of ancient Rome, and made and unmade caliphs as they pleased. In 945 the Abbasid Caliph Al Râhid called upon the neighbouring Persian Dilemite princes to help him in curbing the too powerful Turkish guards, and this arrangement continued for over a century. But in 1055 the then Dilemite emir, who was as much the real ruler as was any one of the French *maîtres du palais* in the falling times of the Karlings, contemptuously proclaimed as caliph the Egyptian ruler, one of the rival Fatimid line, though Al Kayum the Abbasid still lived and reigned at Bagdad. Al Kayum called on the Turks for assistance.

The Turks meanwhile had risen to much power in Central Asia. The first dynasty was that of the Ghasnevids, one of whose sultans was that Mahmud whom, according to the Eastern tale, owls so loved, since ruined villages were never wanting in his time. Mahmud was the first Turk to rise to independent dominion, and received the title of Sultan from the caliph of his day. Subject to Mahmud was the Turkish horde of Seljuk, and under Seljuk's grandson, Togrel Beg, this horde threw off the yoke of the Ghasnevid Turks, and seized on Persia, Togrel Beg becoming thereby the most powerful sovereign of the East (1039). It was to Togrel Beg that the Caliph Al Kayum appealed, and not in vain. The Turkish sultan soon drove out the Persians, and took their place as the acknowledged protector of the head of Islam.

In this short time the Turk had risen to be the head of the Eastern world. Under three powerful sovereigns, Togrel Beg, his nephew and successor, Alp Arslan, and the son and successor of this last, Malek Shah, the Seljuk dynasty rose to splendour. The first became master of the caliphate at Bagdad; the second carried the Turks into European subject-territories, wresting Asia Minor from the Greek Emperor Rômanos in 1071; the third ruled from Kashgar, on the confines of China, to the southern and eastern shores of the Black Sea. At Malek's death this vast Seljuk dominion was divided (1092) between his three sons. He who inherited Asia Minor called himself Sultan of Roum, i.e. of Rome, seeing that he held what had recently been Roman territory. (The Greek emperors always called themselves "Roman.") The capital of the Sultan of Roum was at Nikaia, or in Latin *Nicea* (famous as giving its name to the great Nicene Creed of Christendom),

and less than 100 miles from Constantinople. So near had the Turk come to his goal; but it was to take him over three centuries and a half to overleap this small gap, and it was not the Seljuk, but the Ottoman Turk who was to accomplish it.

Malek Shah, among his other conquests, had annexed Syria, and all but annexed Egypt itself. It was the cruelty of the Seljuk Turks, the sultans of Roum, to whose share had fallen Syria and Jerusalem, that brought about the Crusades. But the First Crusade was fought against the Caliph of Egypt, and not against the Seljuk Turks, because the Saracen caliph's general had succeeded in recovering Syria during the very time the Crusade was in preparation; and the Christians won Jerusalem from the Saracens instead of the Turks, in 1099. But three-quarters of a century later the Seljuk Sultan of Damascus, Nouredin (Nur ed Din), was drawn into a quarrel with Egypt, and sent thither his famous emir, the Kurdish prince El Melik En Nasr Salah ed Din, Yousuf ibn Eiyoub, whom we call Saladin, and who is certainly the noblest Kurd that ever lived. By 1171 Saladin was completely master of Egypt, overthrew the Fatimid (Saracen) dynasty of caliphs, and proclaimed the Abbasid or Bagdad line as nominal rulers. He himself, as vizir, was the actual prince, and on the death of his master, Nouredin, he assumed the title of Sultan of Egypt. His great culture, his chivalry, his bravery, and his good faith earned him the warm admiration even of the crusaders who fought so hard with him. Jerusalem fell before him in 1187, and the Emperor Barbarossa, with the great king Richard Cœur de Lion of England and Philip Augustus of France, led the Third Crusade to attempt its recovery. Dissension in his ranks foiled our brave Richard, and forced him to retreat when actually in sight of the Holy City, September, 1192. He left Syria only 'torn into the hands of traitors and languish in prison; and as for his noble enemy and rival, Saladin, he died at Damascus the very next year (1194). Some of Saladin's work in Egypt yet stands; for the citadel at Cairo and the 350 miles of the Bahr Yousuf (canal of Joseph) worthily perpetuate his name. But his great dominion fell asunder at his death. That son, El Aziz, to whom the sultanate of Egypt fell, is the sultan of the Fourth Crusade; and a brother of Saladin's, El Adil, is the sultan of the Fifth Crusade, aimed specially at Egypt, and led by Andrew, king of Hungary, in 1217.

The early successes of the crusaders broke El Adil's heart, and the throne fell to the only ruler of Turks who can be spoken of as, however distantly, rivalling Saladin. This was Melik el Kamil. Wonderfully skilful is the way in which he led the crusaders into the heart of the country, and then by a clever use of the Nile-flow cut them off from Damietta, their base of supplies. They surrendered, and were forced to evacuate the country. The noble and chivalrous El Kamil next met the equally noble and chivalrous Emperor Frederick II., the knightliest figure of history, in the Sixth Crusade (1228). When the Pope sought to betray the emperor to his foe in a manner peculiarly base, this splendidly generous Seljuk sultan was the first to tell Frederick of his danger, and after such a transaction the two princes could no longer find it in their hearts to be otherwise than friends. Frederick made a very good treaty, even receiving Jerusalem itself on certain conditions (which the Christians afterwards broke), and returned to Europe to fight a far deadlier contest against a foe devoid of nobleness. El Kamil died at Damascus in 1238. Under his rule and that of the still greater Saladin we see the height to which the Turk was capable of rising. But it must be noted that both these great sultans were very lax Mohammedans, and that, though they ruled the Seljuk Turks, they were themselves Kurds by descent. Es Salih, son of El Kamil, was the sultan of the Seventh Crusade, led by the monkish king of France, Louis IX., canonized as Saint Louis,

which ended in both king and army being taken prisoner (1250) just as Es Salih died. Egypt now, while yet the Frenchmen lay in prison, passed under the rule of the Mamluks or Turkish slaves (a large force of whom had been created by Es Salih as a standing army), and its fortunes no longer concern us.

2. *The Ottoman Turks.*—In 1258 Hulagu Khan, grandson of Genghis Khan, the great Tartar conqueror, overran Syria at the head of the terrible Moguls, possibly the greatest scourge the world has seen. In his course across Persia he had slain the Caliph El Mostassem, and thus put an end to the long line of Abbasid caliphs. It was in this very year, and while the Tartar rule yet held, that Othman was born in Bithynia among a savage Turkish tribe, which afterwards adopted his name and became the Ottomans or Osmanli who now are recognized as the chief Mohammedan power. The grandfather of this Othman, Shah Solyman, had led a nameless horde of Turkomans westward from the wilds of Central Asia, crossing the Caucasus in 1214 with nearly 50,000 men, as tradition has it. Probably the number is exaggerated. These Turks lived how they best could, plundering first one district then another, and it chanced that they found themselves near the unhappy Seljuk sultan of Roum when Hulagu Khan and his horrible Mogul Tartars were pressing him hard. Ertoghul was the chief of the wandering Turkish horde at this time, having succeeded his father Solyman, and to Ertoghul the poor sultan turned in his distress, using the savage Turk to drive away the equally savage Tartar, as fire drives out fire. Ertoghul gained the day, and in gratitude the Sultan of Roum allotted to him certain lands in Bithynia, where the horde settled, adopted the Mohammedan religion of their suzerain, and in a short time took, as has been said, the name of Othman, son and successor of Ertoghul. The territory of Roum had by this time sadly shrunk. The Greek imperial dynasty, driven from Constantinople by the Latin Empire founded at the Fourth Crusade, had carved out of Roum two states, whose capitals were respectively Nikaia (Nice) and Trebizond. Othman's territory bordered upon that of the Greek emperor, and he scrupled not to increase it at the emperor's cost, continually reinforcing his fierce soldiery by fresh savages from the Turkoman steppes. Nor was he more sparing of the lands of his Seljuk patrons and fellow Turks, and soon the Ottoman power became a formidable one. Unlike the Seljuks, the Ottomans kept themselves rigidly apart from their conquered Christian subjects, and since conquest, not civilization, is the breath of life of the Mohammedan religion, it is no doubt owing to their preserving this consistent attitude of conquerors that a barbarous and non-progressive race has contrived to exist so long. It was not until the Turks endeavoured to put on European civilization, as an ill-fitting garment, that they began to sink into their present decrepitude.

Othman fitly began the long history of his people by instituting the tribute of children and the murder of dangerous relatives near the throne. In his case it was his uncle whom he assassinated, and ever since it has been an established Ottoman custom to secure the throne by this awful means. The tribute of flesh and blood was a gloss or commentary of Othman's upon that law of the Prophet which permits unbelievers to continue in their own faith upon the payment of a money tribute. Othman demanded children as well, and thus began that famous force recruited by Mohammedan Christian children, which we call the Janissaries, and which in after times was to imperil the rule of his successors. But never while this force lasted did the subject nations revolt against their Ottoman masters, for in the ranks of the first troops they would have encountered were their own children, though individually unknown to them. As for the Janissaries, brought up apart from all human ties, they were the fiercest and most merciless regular

soldiery which ever existed, adding to the ferocity of the savage the terrible might of discipline.

Orkhan, son and successor of Othman, was as ruthless and as able as his father. Still bearing only the title of emir, he openly disavowed that allegiance to the Seljuk sultans of Roum, which Othman had, in fact, already flung off. It was Orkhan who first gained a foothold in Europe. He was called over as a mercenary to help the Greek Emperor Kantakouzenos in 1346, the Greek dynasty being now restored in Europe; and in 1356 Orkhan's Turks, finding the weakness of their imperial employer, seized Gallipolis (Gallipoli) for themselves. This was the first permanent Turkish possession in Europe. Meanwhile Orkhan had reduced all Asia Minor save a few Greek coast towns, and the Seljuk dynasty was at an end. The Ottoman system of conquest was always alike. First a territory was ravaged, burning and slaying right and left simply to strike terror and weaken it. Then it was laid under a tribute so heavy as to be crushing, but leaving just enough to restore the damaged crops and burned villages. Finally it was annexed. Sometimes the ravaging had to be done twice, and thus grew up the proverb that "grass never grew where the sultan's horse had trod." Invented in Asia, the system was applied in Europe, and in this way and no other did Murad (Amurath), successor of Orkhan, extend his kingdom from Gallipolis as a centre.

Murad succeeded in 1360, and already in 1361 he had reached Hadrianopolis (Adrianople), which now and for a century after this was the Ottoman capital in Europe. Murad overran Serbia, Albania, and Macedonia. He fell by assassination on the battlefield of Kossova in 1389, but the field was won before the commander expired, and with it Serbia, Wallachia, and nearly all Bulgaria. It was, in fact, their last struggle for life, and was embittered by the fact that Christian regiments fought in the Ottoman ranks, for Murad systematically made each enslaved people serve to enslave the next. In our happy times the process is precisely reversed, and each liberated nation invites its neighbour to pass through the intermediate tributary condition to the full joy of absolute freedom from the stranger rule which it has so long endured.

It was the well-known Bayazid (or Bajazet) who succeeded Murad; and his rapidity of military movement soon earned him the sobriquet of "the Thunderbolt" or "the Lightning" (*El Ilderim*). His career has elsewhere been described [see *BAJAZET*]; it is sufficient to say here that he was the first Ottoman chief to take formally the title of sultan, which he forced the Caliph of Cairo to give him—sultan meaning or implying the supremacy in civil, as caliph in spiritual, power; that he was the first to besiege Constantinople (1393), and to conquer the Peloponnese (1397); and that notwithstanding his power he fell utterly before the irresistible Timur-i leng when the great Tartar invader burst upon him (1401). Bayazid, as the tale goes, was shut up in a cage of iron bars, and so drawn about in the wake of Timur's army till he died, two years later. Though much doubt has been lately thrown on the story, it has not as yet been disproved. If Bayazid had not been so utterly cruel himself, had not murdered his brother, for instance, to make sure his own succession, one could almost pity the poor bedraggled and insulted Thunderbolt in his cage.

A brief period of division during the time that Timur's huge empire held together was followed by the reunion of the Ottomans under Mohammed I. (Mahomet I.), one of the Thunderbolt's sons. Under him the position was hardly more than regained; but under his able son, Murad II. (Amurath II.), who ruled from 1421 to 1451, the dominions of the Greek Empire were contracted to a narrow strip round Constantinople and some possessions in the Peloponnese, while in 1444 the flower of the Hungarian chivalry fell before the Ottomans at Varna.

Mohammed II., the son of Murad II., was the sultan to whom it was reserved to overthrow the ancient Roman Empire, long since become Roman only in name. In 1453, by taking Constantinople, he deprived Europe of the last relic of a great state. In that year the famous city passed from civilization into barbarism, and who knows when it may return? How soon shall Justinian's superb Church of the Holy Wisdom (Santa Sophia) be washed free from heathendom and reconsecrated to its original Christian sanctities? Fitting was it that the man who first defiled the chief of cathedrals was the most faithless, the most lustful, the cruellest even of Ottomans. It was he who raised to a law the custom of the murder of a prince's relatives; it was he who at the conquest of Eubœa (Eubœa) sawed the governor's body asunder because he had sworn on the Koran not to harm his head if he capitulated. At the same time he was the greatest soldier, the nearest approach to a statesman, the only patron (in a dim way) of art and of literature; in short, the most favourable specimen of development the Ottoman sultans can present to us. The Ottoman Empire as we know it is purely the creation of Mohammed II.

Crossing the Bosphorus, he invested Constantinople with an army of 300,000 men, while the command of the seas was maintained with a fleet of 300 sail. Constantine Palaiologos, the last of the Greek emperors, was not unworthy of his descent from the founder of Byzantium, and defended the "Golden City" for three and fifty days with brilliant valour. But Mohammed knew how to excite the enthusiasm of his soldiers so as to triumph over every obstacle, and Constantinople was carried by assault on the 29th of May, 1453. From that time to the present the Cross has been supplanted on the shores of the Black Sea by the Crescent. The Crescent, however, was in origin neither a Turkish nor even a Saracen symbol, it was the ancient pagan device of Byzantium, connected with the worship of Diana. The Ottomans adopted it when the city fell into their hands, and raised it to a symbol of Mohammedanism.

Mohammed II., after this important conquest, built the Castle of the Dardanelles, and organized the government of the Ottoman Empire. In 1460 he subdued the Morea, and in 1461 led Kohnénos, the Greek emperor of Trebizond, a prisoner to Constantinople. The nations of the West, distracted by their own incessant hostilities, gave but little heed to the rapid encroachments of Turkish power, and Pius II. in vain endeavoured to combine Christendom in a new crusade. Bosnia was captured by Mohammed II. in 1470, and Epirus in 1467, after the death of the gallant Iskanderbeg. The Venetians were compelled to surrender Negropont and Lemnos to his victorious arms; he took Kaffa and Azov in the Crimea from the Genoese; and in 1473 extorted an acknowledgment of his supremacy from the Khan of Crim Tartary. He then pushed forward his conquests in Europe, and had advanced as far as Otranto, in the kingdom of Naples, in 1480, when death cut short his eventful career, and happily enabled the Italians to regain their city. Otherwise it might have played the part of an Italian Kallipolis. His son, Bayazid II. (1481-1512), had not the power of his father, though the extent of his dominions was maintained. The Janissaries began to murmur at his degeneracy, disorders arose, and finally he was murdered by his son and successor, Selim I. (1512-20). Selim drove back the advancing Persians to the banks of the Euphrates and the Tigris, defeated the Memluka, and in 1517 subjugated Egypt, Syria, and Palestine. Then the last representative of the Saracen caliphs, deriving his title directly from the uncle of the Prophet, and wielding a shadowy authority among the Memluk princes of Egypt, fell into the hands of Selim. By what arts we know not, the unhappy man was compelled to nominate Selim his successor in the caliphate,

and as soon as this had been publicly done he vanished for ever from men's sight. Thus an Ottoman Turk sat in the seat of the Prophet.

But the greatest splendour of the Ottoman Empire was attained under Solymán I. (1520-66), called the Magnificent. In his reign the guns of the Ottoman fleet were heard around the shores of Sicily, and the Crescent flaunted defiance to the Christian Cross in the Bay of Naples. In 1522 he captured the island of Rhodes, after a desperate siege, from the Knights of St. John, and in 1526 subdued half Hungary on the field of Mohacz. He exacted a tribute from Moldavia, and in Asia laid the Turkish yoke upon Bagdad, Mesopotamia, and Georgia. While the nations of the West were wasting their strength in fruitless internecine convulsions, his armies crossed the Danube and threatened the existence of Austria, and his triumphant progress was only arrested under the walls of Vienna by the desperate heroism of its inhabitants (1529). His navies, led by the corsair Barbarossa, converted the Mediterranean into a Turkish lake, and his hordes devastated with sword and flame the fair islands of Corfu, Minorca, and Sicily. The Knights of St. John had retired to Malta from Rhodes, and here they endured a second siege at the hands of the Ottomans. After heroic struggles the latter were beaten off, but there is no knowing what would have been the result had Solymán himself taken the field, as he now intended to do. But in the next year death frustrated his designs. When he died the power of the Crescent had reached its culminating point; and our forefathers may be forgiven for the terror with which they contemplated a progress so swift and apparently so irresistible. Had Rome possessed her ancient vigour, there can be no doubt that she would have proclaimed a crusade against these dangerous enemies of Christianity and freedom. Yet Francis of France did not think shame to ally himself with them, and several campaigns in Italy saw the Lilies and the Crescent side by side. As it was, the deliverance of Western Europe from the peril that threatened it seems to have been due to the imbecility of the Turkish princes, rather than to any heroic exertions of the Christian sovereigns. After Solymán the Magnificent, the race of Othman gradually degenerated. Most of his successors ascended the throne from a prison, and wasted life amid the enervating pleasures of the harem, until their career was terminated by poison or the bowstring.

Selim II. (1566-74), the successor of Solymán, was a miserable voluptuary, and, indeed, he earned the name of Selim the Soft. Fortunately for him, he had a very able vizir, Mohammed Sokoli, who redeemed the incapacity of his master. He made peace with Austria, extorting, however, a yearly tribute of 30,000 ducats as a lien upon Hungary. Desirous of connecting the Don and the Volga by a canal, which would place the Black Sea in direct communication with the Caspian, he attacked Astrakhan, as a point of strategical importance, but was opposed by the Russians, a people previously unknown in Southern Europe, and was compelled to retire. In 1570 the Turkish navy was able to conquer and annex Cyprus, the last addition of any importance the Ottoman Empire ever received; but in 1571 the maritime power of the Turks received a crushing blow by the victory of Don John of Austria at Lepanto. This was one of the decisive battles of the world, for it completely freed Europe from further apprehension of Turkish aggression. Don John had under his command the combined fleets of Venice, Spain, Genoa, Malta, and Pius V., and almost annihilated the Turkish forces.

The first embassy from England reached Constantinople in the reign of the next sovereign, Murad or Amurath III. (1574-95), who consented to join Elizabeth in an alliance against Philip II. of Spain. He renewed hostilities with Austria, and advanced victoriously to

within 50 miles of Vienna, but was then overtaken by severe reverses, and compelled to evacuate Transylvania and Hungary. The decline of the Turkish power became still more evident under Mohammed III. (1595-1601), Ahmed I. (1604-17), Mustafa I. (1617, 1622-23), who was twice dethroned, and Othman II. (1617-22), who was strangled; and though Turkey recovered Hungary, she lost in the East Armenia, Kurdistan, and Mesopotamia. Under Murad IV. (1623-40) and Ibrahim (1640-48) the strength of the empire was really directed by the grand vizir Mustafa, and a gleam of success kindled on the Turkish arms. The island of Crete or Candia, in 1645, was captured from the Venetians after a struggle of thirteen years, and some of the eastern provinces were recovered from the Persians.

Mohammed IV. (1648-87) was raised to the throne when only seven years of age, and during his minority the sovereign power remained in the hands of that pampered body of privileged soldiery of evil fame under the title of Janissaries. The Janissaries were no longer the same body which had so powerfully contributed to the rise of the Ottoman dominions, living for the sultan alone, and blindly following his commands. One sultan had allowed them wives, another had admitted Ottoman children as well as Christians to their ranks; so that the force, once a foreign one, without national interest or sympathies, was now encumbered by all the hopes and claims of kindred and faction. Already ten outbreaks were counted in the reign of Murad III., and soon their power rose to the point of deposing no less than three sovereigns in thirty years, namely, Mustafa I., whom they twice dethroned; Othman II., whom they strangled; and Ibrahim.

Here we must note a serious reason for the decay of the ability once manifest in the Ottoman Turks. The custom of the murder of princes by the sultans on their accession had extended itself to a new form, the jealousy of their own children. If a child showed talent fear painted him as dangerous; the earlier sultans had used their sons as viceroys and generals, but their successors confined them to the society of the eunuchs and women of the harem. They were brought up in indolence and ignorance, and the less capable a prince was the better chance he had of living to succeed to the throne. Therefore we see sultan after sultan without capacity or vigour, knowledge or virtue, until the existence of such a rotten state becomes a standing miracle.

Fortunately for the Turks, there rose to the head of affairs at this critical conjuncture one Mohammed Kiuprili, whose military capacity was equalled by his administrative skill. At his decease in 1661 his son Ahmed, not less distinguished for genius and energy, succeeded him in the vizirship. The losses of the previous reigns were almost entirely recovered by the efforts of these two eminent men; and the Ottomans might have established themselves securely in their conquered territories but for the ambition of their successor, the vizir Kara Mustafa, who invaded Austria, laid siege to Vienna, and was totally defeated by the Germans and Poles, under King John Sobieski, and Duke Charles of Lorraine (1683). See SOBIESKI, JOHN.

In 1687 Mohammed was deposed, and succeeded by Solyman II., in whose reign the genius of a third Kiuprili (Mustafa) secured for the Turkish arms a series of triumphs. Austria was several times defeated, and the war was protracted through the reigns of Ahmed II. (1691-95) and Mustafa II. (1695-1703), until, after the death of Kiuprili at Salankement in 1691, the Cross once more rose triumphant over the Crescent, and Turkey was forced to conclude a disastrous peace at Carlowitz in 1699. It was in the later campaigns terminated by this treaty that Prince Eugène first displayed his military genius. Mustafa was now deposed.

In the reign of his brother and successor, Ahmed III.

(1703-30), the Morea (Peloponnêses) was recaptured from the Venetians, but this advantage was more than counter-balanced by the loss of Hungary. Charles XII. of Sweden, whom Ahmed generously protected after the battle of Pultowa, involved him in a war with Russia. In the course of this war the Czar, although surrounded with his whole army, and completely in the power of the Turks, was allowed to escape, through the address of the Czarina Catharine and the imbecility of the Turkish vizir. The peace of the Pruth was concluded, and the only gain to the Turks, who might have stayed for centuries the flood of Russian aggression, was the comparatively unimportant town of Azov, which the Russians had held since 1696. War with Austria followed, and Prince Eugène inflicted defeat after defeat upon the Turks, until his victories of Peterwaradein (1716) and Belgrade (1717) compelled them to sign the treaty of Passarowitz, by which they lost Temesvar, Belgrade, and part of Servia and Wallachia.

Equally unsuccessful were the Ottomans in their campaigns against Persia; and exasperated by so much ill fortune the people rebelled, deposed Ahmed, and flung him into prison. Mahmud I., his nephew, who now became sultan (1730-54), recovered Servia and Wallachia (1739), and encouraged his subjects in the peaceful pursuits of commerce. He favoured the introduction of the art of printing into Turkey.

Of Othman III. (1754-57) we have nothing to record. His successor, Mustafa III. (1757-74), wisely intrusted the sole direction of his affairs to the vizir, Raghib Kiuprili, the able scion of a singularly able family. For some years the empire enjoyed undisturbed peace, and under his skillful administration its heterogeneous parts began to gain consistency. On his death the Russians invaded Moldavia, and the Turks, in an imprudent effort to force the passage of the Dniester, lost the picked soldiers of their army. Moldavia and Wallachia were then overrun by the Russians, who captured all their important cities, and threw garrisons into every stronghold. In 1770 the Ottomans suffered another great disaster; their fleet being defeated in the channel of Skio by a Russian fleet, led by English officers. Egypt at the same time revolted, the Persians made an irruption into the provinces of Asia Minor, and the Crimea was lost for ever.

The reign of Abdul Hamid (1774-89) was clouded by unsuccessful war, and marked by the steady encroachments of Russian power. In fact, so desperate seemed their misfortunes in 1774, that the Turks at Kainardji, on the anniversary of the treaty of the Pruth, and after a discussion of only seven hours, were glad to sign a Russian treaty which has ever since proved the source of infinite misfortunes to them. They agreed to the independence of the Crimea and of all the Tartar country stretching eastward from the Bug to the Berda; they gave up Azov, Kertch, Yenikale, &c.; they admitted the right of free navigation in the Black Sea and the Mediterranean; and finally, they agreed to treat the Danubian principalities with especial lenity, and to listen with respect to the remonstrances of Russia both on this subject, if such should be necessary, and also on that of the Greek Christian subjects of the sultan, Russia now regarding herself as the head of the Greek Church. Ten years later (1784) Abdul Hamid was compelled formally to acknowledge the whole Crimea as Russian. Meanwhile the regencies of Tripoli, of Tunis, and of Algiers had thrown off all but a merely nominal allegiance, and the pashas of Bagdad, of Janina, and of Scutari were almost on the verge of independence. Egypt still consented to receive a pasha, but his power was very small, and the Memlaks were practically free of Ottoman rule. Nor was Selim III. (1789-1807) able to stem the current of disaster. The victories of Suwarov at Bucharest, Bender, and Ismail, brought the Ottoman Empire to the verge of ruin. The outbreak of the French Revolution, and the



consequent changes in Western Europe, however, rendered it necessary for Russia to husband her resources, and the Czarina Catharine accordingly concluded the treaty of Jassy (6th January, 1792) with her humbled opponent. This treaty made the Dniester the boundary line between the two empires. The ambitious schemes of Napoleon in France brought him as a conqueror to Egypt in 1798, and Selim accepted an alliance with his ancient enemy, as well as with England, to defeat the invaders. It was the latter power which really did the whole work of the brilliant campaign, concluding with the glorious victory of Abercromby over the French general Menou at Alexandria in 1801, and the consequent evacuation of Egypt by the French. At Acre, under the command of Sir Sidney Smith, the Turks fought well at the commencement of the struggle, and foiled even Napoleon himself (1799). The sultan, a man of sagacity, perceived that the misfortunes of his realm were in a great measure due to the lethargy, ignorance, and prejudices of his subjects; and he availed himself of a pause in the long course of hostilities to introduce extensive reforms into every branch of administration. He met with the frequent fate of royal reformers: he was deposed and murdered. His successor, Mustafa IV., was also deposed after reigning only a year. Mahmud II. (1808-39) was energetic, courageous, and able. He contrived by a combination of skill and decision to carry out the reforms which his predecessor had inaugurated; and though by the peace of Bucharest (1812) he was forced to grant the Servians internal autonomy; though the successful revolt of Greece, aided by Britain, France, and Russia, deprived him of one of his fairest provinces; though his fleet was destroyed by the combined squadrons, under Sir Edward Codrington, at Navarino (20th October, 1827); though Algiers was taken by France in 1830; though Egypt, under the vigorous guidance of Mehemet Ali, secured a virtual independence; and so threatened Constantinople in 1833 that Mahmud was forced to invoke the aid of his most dangerous enemy, Russia; yet by promoting internal improvements of great importance, by suppressing the turbulent Janissaries in one gigantic massacre (1826), and by introducing into Turkey many of the most beneficial acquisitions of Western civilization, he did much towards arresting the gradual decay of the empire. In the course of the earlier disasters of his reign Mahmud signed the treaty of Adrianople (1829), almost as foolishly as his predecessor had signed the treaty of the Pruthi. For the Russians under Diebitsch had dashed across the Balkans without due support, and another month's delay would have ruined them by famine. But Mahmud was paralyzed by fear, and to get rid of the advancing troops he signed away his undivided sovereignty over the mouth of the Danube, to which the Russian frontier now advanced, and he recognized the Russian sovereignty over much of the Caucasus, thereby throwing open his Asiatic dominions to his foe; he recognized the autonomy of the Danubian principalities, whose Hospodar was now to be elected for life; still further liberated Servia; and formally accepted the freedom of Greece. It was indeed a disastrous treaty, and, considering the extreme danger of the Russian army which enforced it, a very mockery of diplomacy. *Quem Deus perdere vult prius dementat*. This was the second step towards the Crimean war, Kainardji being the first.

The aggressions of Russia attained their climax in the reign of Abdul Medjid (1839-61), a well-disposed prince, who would fain have continued his father's useful reforms but for the incessant interference of the Czar Nicholas. The Russian monarch had cast a longing eye on the fair city of the Bosphorus, and his wish being father to the thought, had come to the conviction that Turkey was as a "sick man," sick unto death. He hinted to Great Britain a desire to share with her the spoil, and when rebuffed by the British government, appears, to have

resolved upon appropriating the whole. On various frivolous pretexts connected with religious matters, and a formal claim to be regarded as the protector of the Christians in the Ottoman Empire, he suspended diplomatic intercourse with the Porte. On the 2nd of July, 1853, the Russian army crossed the Pruthi, a movement which the Turks justly met with a formal declaration of war. Ably led by Omar Pasha the Turkish army crossed the Danube, occupied Kalafat, defeated the Russians at Oltenitza (4th November), and at Citate (6th January, 1854). They were also successful at Karakai, at Turtukai, and at Giurgevo; while the Russians, after a month's obstinate siege, were compelled to retire from before Silistria (26th June). Meanwhile England and France concluded a treaty of alliance with Turkey, and an allied army, under Lord Raglan and Marshal St. Arnaud (who was soon succeeded by General Canrobert), landed in the Crimea, and invested Sebastopol (17th October), after winning the victory of the Alma (20th September). The siege of Sebastopol was relieved by the brilliant incidents of the battle of Balaklava and the charge of the Light Brigade (25th October), the battles of Inkermann (5th November), of Eupatoria (17th February, 1855), and of the Tchernaya (16th August). At first the allied troops underwent great hardships, but on every occasion that they met the Russians their arms were victorious; and the southern part of the city was finally surrendered 8th and 9th September, 1855. Other operations in the Sea of Azov followed during the year 1855, but with the capture of Sebastopol the war virtually ended; and peace was concluded in April, 1856. The treaty of Paris restored to the Turks the entire mouth of the Danube, and to some extent freed her from the dominant influence of Russia.

In 1861 Abdul Aziz succeeded to the throne. His reign was disturbed by revolts in the Herzegovina, and by a formidable insurrection in Crete, which was only suppressed in 1868, after a protracted and sanguinary struggle. In the year 1869, for the first time, an Ottoman sovereign visited Western Europe, and Abdul Aziz was brilliantly entertained at Paris and in London. In 1875 the smouldering rebellion in the Herzegovina broke out afresh, and financial difficulties arose, all of which were so clearly the result of the sultan's extravagance and misgovernment, that in May, 1876, Abdul Aziz was deposed, and in a few days he ended a misspent life by suicide. His brother, Murad V., was installed as successor; but his enfeebled mind gave way under the duties of his new position, and within three months a fresh sultan had to be found in the person of another brother, Abdul Hamid II. In the midst of all these distracting changes Servia declared war; and while the trembling edifice of Turkish power seemed tottering to its fall, the sympathies of England and of Europe generally were alienated by the slaughter and severe ill-treatment of several thousands of Christians in Bulgaria, under fear of a rising threatened in that province also, these "Bulgarian atrocities" taking place shortly before the commencement of hostilities by Servia.

About the close of 1876, and the beginning of 1877, a conference of the European Powers was held at Constantinople, and the various plenipotentiaries unanimously recommended certain reforms. These the Porte declined to accept, on the ground that the independence of the empire would thereby be sacrificed. The Powers generally were content to mark their displeasure at this course by withdrawing their ambassadors; but Russia expressly demanded certain concessions to the Christians and reforms in the government, and failing to obtain from Turkey any guarantee or even promise of these being carried out, she declared war on the 24th April, 1877. Russian troops had previously been assembled on the frontier, and they were now pushed hastily through Roumania to the Danube. The river was not, however, crossed by the main portion

of the army till the 30th June. A flying column was then despatched through Bulgaria under General Gourko, who, to the intense alarm of the Turks, presented himself south of the Balkans on the 13th July. About the same time Tirnova, the ancient capital of Bulgaria, was occupied by Russian troops, the fortress of Nikopolis was captured, the Shipka Pass was taken, and on the Asiatic side also the Russian armies appeared to be advancing with impunity in Armenia. It was speedily found, however, that the triumphant march to Constantinople was not to be so easy a matter as had been anticipated, and that the Turk still retained some of the old desperate valour of his race. Osman Pasha, at Plevna, proved an insuperable obstacle to the Russians advancing in force through Bulgaria, foiled three successive assaults upon his impromptu stronghold, and inflicted upon his adversary the loss of nearly 50,000 men. Rallying at Yeni-Sagra, the Turks beat back the adventurous Gourko into the Shipka, while in Asia the Russians were signally defeated by Moukhtar Pasha at Zewin and Kizil Tepe, and forced back upon their own frontier. The great distances to be traversed caused some delay in the arrival of the badly-needed Russian reinforcements, and at the critical moment had Turkey possessed a general equal to the occasion, an overwhelming disaster might have been inflicted upon the Russians. Not only, however, was the military genius wanting, but disunion and imbecility appeared to characterize the Turkish councils, and the consequences which followed were the natural result. Gathering up their whole strength and summoning their ablest generals, the Russians struck hard and fast on every hand. In Asia Moukhtar Pasha was defeated and his army thoroughly routed; Kars was taken (18th November); and the victorious army of the Grand-duke Michael advanced to Erzeroum. In Europe, the gallant Osman Pasha having been starved out of Plevna, at least 150,000 Russians were set free; and though the snows of winter interposed most formidable obstacles, these were, by a series of splendidly-executed movements, thrown over the Balkans, and a rapid advance was made upon Adrianople, and from thence towards Constantinople, which would probably have been occupied, but for the fact that Great Britain, by sending a powerful fleet up the Dardanelles, intimated her strong objection to this course. The Turks now negotiated terms of peace with their adversary in the treaty of San Stefano. These were exceedingly onerous, and would have involved the almost entire extinction of Turkish power in Europe. Both Austria and England strongly dissented from the terms proposed to be exacted, and on the suggestion of the former power a congress was held in Berlin, which resulted in very extensive modifications of the San Stefano treaty. An indemnity was to be paid by Turkey, but the congress made conditions favourable to the Turkish bondholders. Roumania (whose troops had been allied with those of Russia in the war), Servia, and Montenegro, were each recognized as independent, with accessions of territory in each case. Bulgaria was transformed into an autonomous tributary state, and to the considerable Bulgarian district south of the Balkans was granted a sort of conditional autonomy, with a Christian governor. Bosnia and the Herzegovina were handed over to be "occupied and administered" by Austria. Russia obtained Kara, Batoum, and about 12,000 square miles of adjacent territory in Asia, and also the part of Bessarabia up to the northern shores of the Danube, which she had been compelled to surrender after the Crimean War. In 1886 Alexander, the first prince of Bulgaria, accepted the sovereignty over the southern state, hitherto called Eastern Roumelia, a course which, coupled with his military capacity as shown in a severe contest with Servia, so roused the jealousy of Russia that his abdication was secured (September, 1886). It was not till nearly a year

later that a second prince was found, in the person of Ferdinand, to accept the trying post.

The effect of these changes upon the population of the Turkish Empire we have already shown. Of their ultimate beneficial effect upon the Christian races yet under Ottoman rule there can be little doubt. The war was regarded by many as waged by Russia simply to advance her own ambitious ends; but if the provisions of the Berlin treaty are faithfully maintained Russia will not practically be nearer, if so near, to Constantinople as previous to the war. While the conference was still pending, the British government concluded a convention with Turkey, which gave Great Britain a "protectorate" over Asia Minor, and the occupation of the island of Cyprus. Many reforms were stipulated for in this convention, and if carried out they would raise the Turks in the estimation of civilized nations, and tend to defer the probably inevitable period when the last of the Osmanli shall bid farewell to the shores of Europe. The condition of the country, however, still indicates not only the utter inability, but the same indisposition which has previously existed, to effect any reforms at all.

#### TURKISH LANGUAGE AND LITERATURE.

The languages spoken by the different tribes of Turkish or Tartar origin form a principal division of the great Uralo-Altaic or Turanian family, of which the chief characteristics have been pointed out in *TURANIAN RACE AND LANGUAGE*. They constitute together a well-marked group of nearly related idioms; even the Yakut—the one which differs most from the rest, and is supposed to have severed itself from the main stem before the division of the latter into its other branches—is so distinctly a Turkish language, that its relationship is apparent upon the most superficial examination; and it has been asserted, though with questionable accuracy, that a Yakut from the Lena could make himself passably understood at Constantinople. The Tartar dialects are for the most part known only by scanty vocabularies and the descriptions of travellers; a few have been treated grammatically; three or four, as the Uigur, the Jagatal or Oriental Turkish, and the Osmanli, have received literary culture, and are to be studied in written monuments. Of these last, the dialect of the tribe which has been for 500 years dominant in European and Asiatic countries, or the Osmanli Turkish, as it is distinctively called, is of by far the greatest importance, and to it we shall chiefly direct our attention. Its peculiarities are such as naturally result from its position and its culture under the powerful influence of Arabic and Persian; every part of its vocabulary, and even some departments of its grammar, are filled with Arabic and Persian elements; so that it presents the remarkable and unique spectacle of a dialect made up of materials derived from the three grand and totally disconnected families of language, the Turanian, Semetic, and Aryan or Indo-European, to the detriment, of course, of its native character, by the corruptions of its forms and the artificiality of its style. This is true especially of the language taught in the grammars and written in the literature; the vernacular idiom of the people is a much purer Turkish. The Osmanli is usually written with the Arabic alphabet, which is exceedingly ill suited to it, as well as to the Persian, since it marks the vowels very imperfectly, and in its distinction of consonantal sounds is in part defective and in part redundant; to construct the spoken alphabet and phonetic form of the language from the published grammars is well nigh impossible. It is also sometimes written with the Armenian alphabet, which represents it much more faithfully. It has nine vowels: four hard, *a*, *o*, *u*, and a peculiar guttural *i*; and five soft, *ä* (a flat), *e*, *i*, *ö* (French *eu*), and *ü* (French *u*). In the same word, as a general rule, only vowels of one or of the other of these classes are allowed to succeed one another; the dominant syllable, which is usually the final one of the root or theme, assim-



lating to its own character all that followed it. The consonants are *y, r, l; ng, n, m; s, z, sh, zh; kh, gh, f, v; k, g, t, d, p, b; h*, and the compounds *tch, j*. The language has no proper articles, although its numeral "one" and its demonstrative are sometimes used nearly as articles. The adjective is uninflected. The nouns have no distinction of gender; their plural is formed by the addition of *lar* or *ler*. There is no nominative case-ending; the unchanged theme is employed as subject, in address (vocative), and also as the indefinite object of a verb. Of cases, formed by inseparably affixed particles, which may properly be regarded as terminations of declension, there are an accusative, in *i*; a genitive, in *ung*; a dative, in *e*; an ablative, in *den*; an instrumental, in *le*; and a locative, in *de*. These affixes are, saving certain slight euphonic changes, invariable; they are appended to the simple theme in the singular, and to the plural sign *lar* in the plural. The numerals are: 1, *bir*; 2, *iki*; 3, *üç*; 4, *dört*; 5, *beş*; 6, *elli*; 7, *yedi*; 8, *sekiz*; 9, *dokuz*; 10, *on*; 11, *on bir*, &c.; 20, *yeyirmi*; 30, *otuz*; 40, *kırk*; 50, *elli*; 60, *altmış*; 70, *yedmiş*; 80, *seksen*; 90, *doksan*; 100, *yüz*; 1000, *bin*. To form the ordinals, *inci* is added. The personal pronouns, which alone offer some anomalies of declension, are: I, *ben*; we, *biz*; thou, *sen*; ye, *siz*. In the third person we have rather a demonstrative than a personal pronoun: that one, *o*; those, *onlar*. Possessive pronominal suffixes are: *m*, my; *miz*, our; *n*, thy; *niz*, your; *i* or *si*, his, hers, its; *ları* or *leri*, their. These are appended directly to the nominal theme, singular or plural, and the affixes of case follow them, as *baba-lar um-dan*, from my fathers. There is no relative pronoun, except the Persian *ki*. The verbal roots are not always reducible to a monosyllabic form. From each root are formed a number of themes of derivative conjugation, by adding conjugational affixes; these are—for the passive *il*; for the reflexive, *in*; for the reciprocal, *ış*; for the causal, *der*; and for the negative *me*; which last, by prefixing *e*, becomes a sign of impossibility. Any or all of these affixes may be combined at once with a verbal root, so far as the idea admits of their combined modification; so that in theory we may have as many as thirty-six themes from one root, each conjugated throughout in the same manner as the simple root—e.g., from *ser-mek*, to love (*mek* is infinitive affix), come *ser-il-me-mek*, not to be loved; *ser-der-il-mek*, to be made to love; *ser-ış-il eme-mek*, not to be able to be loved by one another, &c. The root of the verb, without affix, is the second person singular imperative—e.g., *se-r*, love. The tenses and moods are of two kinds, simple and periphrastic. The former are formed either by appending a predicative pronominal suffix to a participle (except in the third person, which is left without suffix), or by adding a possessive suffix to a noun of action; thus, from *dogmak*, to strike: pres. part. *dogur*, striking; pres. *dogur-um*, striking I, i.e., I am striking, I strike; pret. *dogul-um*, striking-mine, i.e., I have struck. The periphrastic tenses are formed by combining a participle or noun of action with an auxiliary verb; as *dogmish idim*, having struck was I, i.e., I had struck. By these means, a great variety of more or less genuine verbal forms is produced, in the admission and classification of which, however, grammarians greatly differ; and the verbal paradigm is a very rich one as regards the number and nicety of its distinctions. What are prepositions in other languages are in Turkish postpositive affixes; but many proper prepositions are borrowed by it from the Arabic and Persian, and are placed and construed according to the usage of those languages. It is almost entirely destitute of any conjunctions except those of Arabic and Persian origin, some of which—as those for and, but, or, if, as, that—are in frequent and familiar use, although more in the formal and written style than in the conversational. The place of conjunctions is supplied by gerundives and possessive forms, through means of which the different members of a

compound sentence are twined into one, with the principal verb always at the end. This position of the verb, together with the operation of the rule that the determining word must precede the determined, gives the Turkish construction an inverted form which often seems very strange.

*Literature*.—The earliest literature produced by any of the divisions of the Turkish race is that of the Uigurs, a remote Eastern branch of the family, who originally occupied the country south of Lake Baikal, but later established themselves about the Tangnu Tagh, and played a conspicuous part in the contests and migrations of Central Asia during several centuries, until their nationality was swallowed up in the Mogul Empire, about 1200 A.D. Something of culture and Christianity was communicated to them from Syria, doubtless by Nestorian missionaries; and their scanty alphabet, of fourteen characters, formed from the Syriac, became later the parent of the Mogul and Mantchu alphabets. Most of the Uigur literature is lost, and of what remains only a few relics have found their way to Europe; little of it is known in detail, although it has been made to yield some information respecting the history of the people. They are said by the Chinese to have received and translated the Chinese classics and histories, and they are known also to have adopted to some extent the Buddhist doctrines and literature.

The second era of Turkish culture dates from the conquest by Turkish tribes of the countries of Mohammedan Asia, beginning with the latter half of the tenth century. Overrunning first the north-east provinces of Iran, and finding there the new Persian literature beginning its career, their wild chiefs became its admirers, patrons, and imitators, and the Turkish mind and language received that strong Persian impress which they have ever since borne. The Eastern Turkish literature, or that produced beyond the Caspian, is usually called the Jagataian, from the name given to the country east of the Oxus in the partition of the Mogul Empire. It is much less abundant, and also much less known, than the literature of the western branch. Its most flourishing period was from the time of Tamerlane (1100) to that of Baber (died 1530). Its most admired author is Mir Ali Shîr, the vizier of Sultan Hussein, and a magnificent patron of Persian authors, particularly of the poet Jami; his most interesting work, perhaps, is his collection of biographies of earlier Jagataian poets, with specimens of their productions. The memoirs of his own life and times by Sultan Baber, the conqueror of Hindustan and the founder of the Mogul dynasty, cover a period of nearly forty years, and are written with entire simplicity and naturalness. The astronomical works prepared at Samarcand, under the patronage and direction of Ulugh Beg (died 1149), grandson of Tamerlane, deserve honourable notice. The literature of the Western or Osmanli Turks, to which alone we usually apply the name of Turkish literature, is exceedingly rich, but it is upon the whole of inferior interest, because it contains so little that is original and distinctively national in style and spirit. It is mainly an imitation more or less successful, of Persian models, but in part also of Arabic. As the language of the Osmanlis is full of Persian words, compounds, phrases, and even forms of construction, so is their history, their philosophy, their poetry, a reworking of Persian material, an echo of Persian taste. The history of the Osmanli literature begins with that of Osmanli nationality; even before the power of the dynasty was established by the capture of Constantinople, works had been produced which the nation has never let perish, and has hardly excelled: prominent among the great names of this era are those of Sheikhî, the romantic poet, and also the ablest physician of his time, of Solyman Tchelebi, and of Nesimi the freethinker. But the most flourishing period in the whole history of the literature was the sixteenth century, chiefly during the reigns of Solyman the

Magnificent and his son Selim II. Meshihi, renowned as an elegiast, and Kemal Pasha Zadeh, a man of universal learning and an admired author in many different departments, especially in history and in Moslem jurisprudence, wrote early in the century. Both these branches are of great importance and prominence in the Turkish literature. The latter, of inferior interest to us, but of the highest consequence to the Turks themselves, in its double aspect, religious and legal, and indispensable to those who would fully understand the internal life of the nation, is illustrated by an unbroken series of great writers. In history, besides general and independent authors, such as Mohammed Effendi, Betechevi, and Hadji Khalifa, the line of official historiographers and annalists of the realm, commencing with Saad-ed-Din, deserves especial notice. Among his successors were Naima, Reshid, Izzi, and Vasif. Notwithstanding the turgid and affected style of the official historians, they are most valuable authorities for the history of the Ottoman Empire, in its internal and external relations. Saad-ed-Din wrote under Solymán, and has been excelled by none who came after him in dignity and philosophic spirit: he brought the story of the rise and growth of the Turkish power down to 1526. Of the same period is Lami'i, one of the most highly esteemed of Turkish authors, and in some departments quite unsurpassed; his works are both in prose and verse, and include many translations from the Persian. Fasli, distinguished by depth of thought and tenderness of sentiment, lived till 1563. But the chief ornament of the century is Baki, the acknowledged prince of Turkish lyric poets, and ranked by the Orientals with the Persian Hafiz and the Arab Motanebbi in the trio of unrivalled masters of song. He died at a great age in 1600.

A new period of literary activity and excellence, although decidedly inferior to that already referred to, followed in the seventeenth century, under the patronage of the great vizier Köprülü in the reign of Mohammed IV. Most worthy of note here are Nebi, the most admired poet of the century, Nebi, the first of Turkish satirists, Naima the historian, and Hadji Khalifa, the historian, geographer, biographer, and encyclopædist, a man of immense learning and industry, whose history of Arabic, Persian, and Turkish literature, in Arabic, is a chief authority upon its subject for both the East and the West. In the eighteenth century, the distinguished vizier Raghib Pasha is eminent both as an author and as a patron of learning; but among the innumerable writers, in every department, of the last century or two, there are few who deserve to be particularly noticed; we may mention merely Said Rufe' Effendi, Aini Effendi, and Pertev Effendi as the most esteemed poets. The Turks have done little for the grammatical and lexicographical illustration of their own language, but a great deal for that of the Arabic and Persian. The press was introduced into Constantinople early in the eighteenth century, by Ibrahim Effendi, and, both there and elsewhere, has been actively engaged in publishing the most important works in Arabic, Persian, and Turkish, especially the last (including the series of official histories), together with a large number of less valuable or altogether insignificant productions. Many translations have been made by the Turks of European as well as Oriental works.

**TURKISH MUSIC** is a phrase of the older masters, such as Haydn, Mozart, Beethoven, &c., to express a barbarous kind of accompaniment of instruments of percussion, such as gongs, cymbals, drums, bells, &c., to a march or dance movement.

Turkish music is not actually quite so rude as this, for the conquest of the Saracen power has for centuries given to the Ottoman Turks their various string and pipe instruments. This is well-figured by a legend, devoutly held as historical truth by all Ottomans, of the final capture of Bagdad at the hands of the Turkish Sultan, Murad IV.,

in 1638. The savage had ordered no less than 30,000 inhabitants to be slain before his eyes, when just as the horrid massacre began, the Persian musician, Shah Ruli, appeared with his harp and sang so touchingly that the Sultan burst into tears and pardoned the whole. Not only so, but he took Shah Ruli and others with him to Constantinople, there to teach his art and refine the Turkish nation. The famous song, or what professes to be the song, is still extant.

The instruments most favoured by Turks are, however, those of percussion. The *kanoon*, a sort of dulcimer, is the pianoforte of the ordinary harem, and the *tamboura*, a sort of mandoline played with a plectrum, is also a very favourite instrument. The *rebab*, a rude one-string viol played with a bow, is the usual accompaniment of the improvisatore, or travelling poet and story-teller of the coffee-houses; and there are some small varieties of pipe, the best of which is the *zurna*, a simple oboe. In the manufacture of cymbals and tambourines, the rudeness and simplicity of the instruments just named give place, however, to an unrivalled finish. A fine pair of Turkish cymbals (Turk. *zil*) is as peculiar in its way as is a Chinese gong in its own department. One manufacturer in Constantinople exports 1300 pairs annually to various parts of Europe, the average cost in Constantinople being 30s. the pair.

**TURKOMANS.** See TURKISTAN and TURKS.

**TURKS**, one of the most important branches of the Turanian family. [See TURANIAN RACE AND LANGUAGE, and TURKISH LANGUAGE AND LITERATURE.] In former ethnological classifications they were sometimes set down as a Caucasian race, and in physical characteristics some of their tribes are nearly or quite Caucasian; but more recent science shows that they have no connection with the Aryan or Indo-European family. They made their first appearance in Northern and Central Asia among the Hunnic and Tartaric hordes who for several centuries before and after our era were the terror of the Chinese. [See CHINA, HUNS, and TARTARS.] Turk is used in Central Asia as synonymous with Tartar, or to designate the Mongolians generally. Before the commencement of the Christian era a tribe of Turks had wandered westward as far as the Don; they are mentioned by Pliny under the name of Turcae, and by Pomponius Mela under that of Iurcae; while other tribes had not long after penetrated into the mountainous regions of Asia Minor. In the fourth and fifth centuries of the Christian era a portion of the Turks who had remained in North-western China conquered two provinces of that country, which they organized as independent kingdoms, to which the Chinese give the names of Chao and Northern Liang; but the greater part of those who were driven out in the third century rallied around Lake Balkash, and after the fifth century made no further separate appearance in history. In the early part of the sixth century a new Turkish Empire, apparently having its nucleus in what is now Eastern Turkistan, threatened the peace of Asia. These Turks renewed their conflicts with China at the east, and with Persia at the south-west, and in 569 formed an alliance with Justin II., then Emperor of Constantinople, for the overthrow of the Sasanides. But this Turkish Empire (which the Chinese called Tu-kiu), like all the attempts of the Turks at imperial domination, was an agglomeration of dissimilar peoples in one huge nation, with no common bond of union or citizenship, and its very vastness contributed to its weakness. In 744 the empire was overthrown by the attacks of the Hœi-he or Hœi-hu, as the Chinese named them (the Ugurs of Western writers), another Turkish tribe who had previously been subjects of the Tu-kiu Empire. There were at this time, and had been for some centuries, eight distinct Turkish tribes or nations in Central Asia. The Ugurs never attained to the vast power

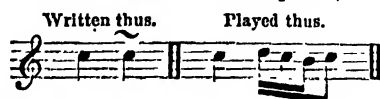
of their predecessors, but they were the first of the Turkish tribes to adopt a written language. At first they were Buddhists; but about the fourth century they became very generally disciples of Zoroaster, and in the ninth or tenth century embraced Islamism. In the West their empire was overthrown in 848 by the Kirghiz Tartars; but they maintained an independent kingdom in the valleys of the Thian Shan range till about 1000, when the increasing power of the Khitans in China compelled their emigration westward. The invasion of Genghis Khan overthrew the last remains of the Turkish Empire in Central Asia; but the prominent officers of that conqueror and his successors were taken from this very tribe of Uigurs on account of their superior intelligence. But meanwhile the Turks had been acquiring new territories in the west. In the sixth and seventh centuries they were already in possession of an extensive region in what is now Asiatic Turkey, and were pressing forward toward South-east Europe. In the ninth and tenth centuries the Tulunids and Ikshids, who founded short-lived dynasties in Egypt before the Fatimids, were Turks. In the ninth century a Turkish dynasty, the Tahirids, ruled in Khorasan; and their successors, the Ghaznevids and the Ghorids, extended their sway from Persia to India between the tenth and twelfth centuries. But a more famous Turkish dynasty than either of these was that of the Seljuks, whose dominion extended in the latter part of the eleventh century from the frontiers of China to the vicinity of Constantinople. [See SELJUKS.] Like its predecessors, this vast empire crumbled to pieces from its want of homogeneity, and the Seljukian sultans submitted to be tributaries of the Mogul emperors. About the beginning of the fourteenth century the Ottoman Empire was founded by Othman, a Turkish chief, and in the succeeding centuries spread over a vast territory in Asia and Europe. [See TURKISH EMPIRE.] The Turkish tribes which had submitted to the Mogul invasion in the thirteenth century, and still remained in the region of the Thian Shan Mountains, the Aral, and the Caspian, sent out colonies north of the Caspian into that portion of Southern Russia lying on the borders of the Black Sea, where, under the name of Tartars, several tribes of them still occupy extensive territories. While acknowledging the Russian sway, they are still zealous Mohammedans. The Mogul invaders of Turkestan, instead of impressing their own habits and language upon the Turks of that country, gradually became identified with the people they had conquered; and eventually, the Turkish element again predominating, in the age following the death of Timur, they had invaded and subdued Armenia and the countries bordering on the Tigris and Euphrates. From this region they were expelled in the sixteenth century by the Sufis. In the same century the Uzbeks, a Turkish tribe, primarily inhabiting the southern provinces of Chinese Turkestan below the Thian Shan Mountains, and said to be descendants of the Uigurs and the Naimans, made their way westward, and overran not only Eastern Turkestan, but the countries adjacent as far as the Euphrates, and were, after maintaining their power for more than a century, reduced to subjection by still another Turkish tribe, the Turkomans. The Turkomans and Uzbeks are now, in the ancient seat of the Turks, the principal remaining tribes of that powerful race. The Kalmyks between the Lower Volga and Don, the Bashkirs between the Volga and Irish, and the Yakuts on the banks of the Lena, are also Turkish tribes. The Yakuts are the only Turkish race professing Shamanism.

**TURMERIC.** See CURCUMA.

**TURN** (*Turn of the Market, Jobbers' Turn*), a term of the Stock Exchange, signifies the difference between the buying and selling price of stocks and shares. The jobber or merchant quotes a double price to the broker before he knows whether the broker desires to buy or to sell on behalf of his principal, the jobber being prepared to buy at

the lower price and sell at the higher price he has just "made." Thus, if consols are quoted 101 to 101½, it means that the jobber is prepared to buy them at 101 or to sell them at 101½. The difference of ½ is the "turn of the market," and forms the jobber's remuneration. The more stable the stock the less the turn, the more speculative the stock the greater the turn, as a general rule.

**TURN** (Ital. *torno*, Anglo-Saxon, *tyrnan*), in music, a grace marked ~, which indicates a short phrase turning about the note over which the mark is placed; as—



**TURNER, JOSEPH MALLORD WILLIAM**, the greatest English landscape painter, was born at 26 Maiden Lane, Covent Garden, on the 23rd of April, 1775; but the house, which stood at the corner of Hand Court, was pulled down in 1862 to make way for improvements. William Turner, his father, was a hairdresser, of sufficient liberality of mind to allow his son to follow the bent of his genius, and even while a boy to prosecute at leisure his passion for drawing. It is owing to this fortunate circumstance that we find Turner admitted as an exhibitor to the Royal Academy so early as his sixteenth year. He had become a student of the Academy in 1789; and in 1790 he exhibited a view of Lambeth Palace, a water-colour drawing. Turner's early efforts were nearly exclusively water-colour drawings. His first oil picture, a "View of the Thames at Millbank, by Moonlight," was exhibited in 1797, and is now in the National Gallery. The style of his early youth was that of Girtin and Cozens, who both died while Turner was still young, and whose dry manner scarcely deserves the title of "water-colour painting." The best of their works are but flat Indian-ink drawings, tinted with washes of colour; they display much spirited handling, but little brilliancy, and less chiaroscuro. The imitation of these men must have kept Turner back, rather than otherwise. His true master was Wilson; many of Turner's earlier oil pictures are so like Wilson's that it is difficult, if not impossible, to distinguish them. In this early time architectural views seem to have been Turner's favourite subjects; as he advanced in age and in power, marine views supplanted the architectural. He appeared as a finished oil painter in 1799, when he exhibited his "Battle of the Nile." He was elected an associate of the Academy in this year, and a full academician in 1802. He now left Hand Court, in 1800, and moved to 64 Harley Street. Though he still painted somewhat in the style of Wilson, Turner was always original; his early studies of Wilson soon led to an independent style, and the same happened with his later emulation of Claude. It was long before the works of Claude had any influence on his own efforts, and even then his study of Claude was induced by the then fashion of making Claude the standard of excellence by which all landscape painters were to be measured. It was unnatural or impossible for Turner to be an imitator; and after developing a style somewhat analogous to that of Claude, he almost immediately afterwards forsook it for one quite peculiar to himself—less vigorous than his earlier style, but more poetic. "Calais Pier," "The Frosty Morning," and "Crossing the Brook," were works of surpassing power; but with "Ulysses deriding Polyphemus" (1829) he showed a grandeur of conception and splendour of colour which placed him in the ranks of the world's greatest artists. Not less marked was the advance in his water-colour drawings. The celebrated series of seventy-one plates in brown ink, partly etched and partly mezzotinted, known as the "Liber Studiorum," commenced in 1807, and continued for eleven years, greatly widened his fame. Two other series of Turner's were the sets of

engraved prints entitled "The Southern Coast" and "England and Wales." These were followed by "The Rivers of England," "The Ports of England," and "The Rivers of France." Samuel Rogers, although an indifferent poet, was a wealthy banker, and he secured immortality for himself by engaging the great artist to illustrate his poems, notably "Italy" (1830). In 1807 Turner was elected professor of perspective in the Royal Academy, succeeding Edwards. It was a most absurd appointment for a painter who habitually soared above the narrow mathematical rules which limit accurate perspective, and which only geniuses like himself can neglect with impunity. In 1812 he built a house and gallery in Queen Anne Street, West, No 47 (now 23), which he retained until his death, though he used it only as a depository for his pictures during the last few years of his life. He had at this time also a country house at Twickenham. Turner visited Italy three times, in 1819, in 1829, and about 1840. He had visited France and Switzerland as early as 1801 or 1802. He resided at the close of his life in a small house at Chelsea, a little west of Battersea Bridge, under the assumed name of Booth, and here he died on the 19th of December, 1851, in his seventy-seventh year. His body was removed to his house in Queen Anne Street, and from there he was buried in St. Paul's Cathedral, "among his brothers in art," where a statue has been placed to his memory, by P. MacDowell, R.A., for the cost of which he made a provision of £1000 in his will. He was never married, and he was so exclusively devoted to his art and exceedingly eccentric in his habits that he has the character of having an unsocial disposition. Evelina and Georgiana Danby, mentioned in his will, were his own daughters by Sarah, widow of the musical composer John Danby, uncle of Hannah Danby, Turner's housekeeper, who had charge of his gallery in Queen Anne Street. The portraits of Turner are very rare; there is a characteristic sketch of him, stirring a cup of coffee, by Count D'Orsay. Leslie the painter says: "Turner was short and stout, had a sturdy sailor-like walk, and might be taken for the captain of a river steamboat at a first glance." The great painter's property was sworn under £110,000. He bequeathed nearly everything to his country—his pictures to the National Gallery, and his funded property towards the establishment of an institution for the benefit of decayed artists. The will was disputed, and settled by compromise in 1856; the pictures and drawings were awarded to the nation; £20,000 to the Royal Academy for the benefit of art; and the rest of the property to the next of kin. About 100 finished pictures by Turner, besides some thousands of drawings, are now exhibited in the National Gallery at Trafalgar Square. The pictures comprehend, independent of his imitations of Claude, three styles—his early vigorous manner, which was completely developed by 1799, and endured, with little change, until 1819; he then adopted his own original brilliant style, of which "Caligula's Bridge," "The Bay of Baia," "Child Harold's Pilgrimage," "Ulysses deriding Polyphemus," "Venice from the Canal of the Giudecca," and the "Approach to Venice" are examples of immortal fame. The "Fighting Temeraire tugged to her last Berth" (1839) is by many held to conclude this period, and to mark the boundary between the second and the third style, which gradually declined into extravagant display. Contrasts of light, colour, and shade, with scarcely a hint of form in any of his compositions, from 1840 onwards. Though many of his pictures, even of this period of decline, are works of great genius.

Of the characteristics of Turner in his great period, that which is most striking is his unrivalled power of painting light. When one considers that every pigment, rightly considered, is so much darkness, this power seems nothing short of miraculous; and we cannot wonder that no one before or since this incomparable artist even possessed it.

Next comes his also unrivalled power of realizing space and air, floating cloud-mist and vapour, and after that his mastery of the forms of water in motion, from the ripple of a river to the grandeur of a storm at sea. Then, too, in all his greater works there is a profoundly poetic thought embodied. That man is to be pitied who cannot feel the radiant joy of the "Ulysses," or the intense melancholy of the "Temeraire." By pure form and colour Turner affects the mind as other painters can only do with the help of written motto or familiar tale. He speaks to the heart as powerfully as Shakespeare or Browning. In his latest years, whether from failing eyesight or from what other cause we cannot rightly judge, he seemed to lose his mastery of form, and to permit his vague mystic thought to flow uncontrolled from his pencil, and thus he defeated his own object and became obscure.

The literature which deals with Turner's achievements is very extensive. Of most importance is Ruskin's "Modern Painters," but many of the works of that eloquent writer may be read in this connection; Thornbury's "Life," Hamerton's "Life," and Cosmo Monkhouse's excellent little biography are alike interesting; then Rawlinson's "Turner's Liber Studiorum," Stopford Brook's "Notes on the Liber Studiorum," Pye and Roget's "Notes on the Liber Studiorum," Wedmore's "Studies in English Art," and Redgrave's "Century of Painters of the English School," should be studied. Many anecdotes are found in Frith's "My Autobiography and Reminiscences" (1887).

**TURNER, SHARON**, the historian of the Anglo-Saxons, was born in London in 1768. From the perusal of the death-song of Ragnar Lodbrog he was induced to collect materials for the composition of a history of the Anglo-Saxons, or, as we now should say, the Older English of the Pre-Norman period. The scrupulous painstaking spirit he manifested in seeking out original sources of information, and in verifying the facts he desired to narrate, did much to inaugurate a new era in the historical literature of England. The work, which was published in four volumes (1799-1805), gave a great impulse to the study of the earliest English history. It is learned and laborious, yet in all that relates to the language and the poetry of our forefathers it is often deficient, and valuable as it once was, it has now long been superseded. Turner wrote many other historical works, all of great merit in their day. He died in London, 1847.

**TURNERA CEE** is a small order of dicotyledonous plants belonging to the division Polypetalæ, cohort Passiflorales. [See BOTANY.] The species are herbs or undershrubs, natives of the West Indies, South America, and tropical Africa. They have little-used tonic properties, due to astringent and mucous principles, with a small quantity of volatile oil. The principal genus is *Turnera*, of which species are cultivated in greenhouses. They are mostly natives of Brazil, and have alternate leaves and regular axillary yellow or blue flowers.

**TURNING LATHES** have been in use since remote antiquity. Talos, son of Daidalos, is supposed to have invented them at the purely legendary date of 1240 B.C. Mention is made in the Old Testament of the potter's wheel, in which the axis is vertical, not horizontal. Pliny, crediting Theodoros of Samos as the inventor, refers to one Theriklēs as famous in the art. We are told, moreover, that the ancients commonly observed, when anything was done accurately and delicately, that it was as if it had been turned within the lathe. But if the lathe had already much importance in those times, its value to the modern mechanic is incalculable. The most delicate articles of luxury and ornament are produced by it. It is a most important adjunct in the manufacture of the steam-engine, and is equally needful in the fabrication of those machines in which the circle, or modifications of it, are discovered.

There are various forms of lathe. In the centre-lathe,

the work is supported at both ends; in the spindle, mandrel, or chuck-lathe, it is fixed on the end of a spindle. The pole, the hand-wheel, and foot-wheel lathes derive their name from the manner in which they are put in motion. The power-lathe is used only for powerful work, and is turned by water, steam, or horse-power. Bed-lathes are those used by the turners in wood; bar-lathes are principally for metal work; and the turn-bench is the metal centre-lathe employed by watchmakers. But certain characteristics are common to all lathes. Thus, for outside work, it is essential there should be two *points*, to sustain the work at each end, and to allow it to turn freely on its axis; secondly, a *rest* or support for the tool; and thirdly, an instrument for causing the work to revolve. In inside work, the essential requisite is a spindle or mandrel, to which the work is fixed, by which it is turned round, so that the tool, being applied to the free end of the work, produces a hollow or excavation.

In the operation of turning, also, there are certain universal processes. The work to be reduced to shape is put into the lathe, and, revolving on an axis with a circular motion, is brought into the intended form by means of tools presented to it and held fast upon a fixed rest. The projecting parts of the work are thus pared off, and the outer surface is so reduced as to be equal in distance from the axis in motion, and to possess a circular shape. The work may also be turned hollow with a cavity inside; the exterior surface may be grooved or fluted, or in fact turned to any shape.

We pass to a detailed description of the *centre-lathe*, employed in forming the outside surface of the work; and of the *mandrel-lathe*, arranged for turning hollow work.

The most simple form of the centre-lathe is often called the *pole-lathe*, and consists of two beams of wood fixed horizontally on legs like a bench, forming the bed of the lathe. The beams are fixed a small distance asunder, the space between them being for the reception of the tenons at the lower end of the poppets, short posts which rise perpendicularly from the bed, and are firmly tied thereto by means of cross wedges passed through the tenons beneath the bed. One of the poppets carries an iron pin, and the other tenon has, at the same level above the bed, a centre screw working through a nut. Both the screw and the pin are furnished with sharp steel points, which pass into the ends of the work and fasten it securely. A rail or bar (the "*rest*"), extending from one poppet to the other, and lying on hooks projected from the poppets, supports the tool. The whole is put in motion by a treadle, to which is fastened a piece of catgut, passing two or three times round the work, and attached to the elastic pole or *lath* over the head of the turner, which gives the name lathe to the instrument. Motion is given to the instrument by the workman, who, pressing his foot upon the treadle, causes the work to revolve rapidly, unwinding the cord towards the treadle, and winding it up on the side near the lath. Meanwhile the workman places a gonge or chisel on the rest, and by the motion of the work against it the latter is cut, or rather, perhaps, it cuts itself, into a circular form. But after each pressure of the treadle he removes his foot, and the reaction of the bent lath causes the work to roll back until the lath becomes straight again. During this backward revolution, of course, no cutting is done. The advantage of this simple form of lathe is sufficiently conspicuous, but its working necessitates much loss of time; and although its great simplicity renders it very useful to carpenters in the manufacture of the legs of stools, &c., yet it is generally superseded in favour of the foot-lathe or mandrel-lathe.

More complicated, but more useful than the preceding, is the mandrel-lathe. This machine has two uprights of oak or mahogany, on which it supports the bed, consisting of two bars of iron with a space between them. A cast-

iron frame is fastened to the bed, in order to support the spindle or mandrel; while the work, if outside turning is to be done, is supported at both ends, as in the centre-lathe; at one end by the extremity of the mandrel, and at the other by the back poppet. This poppet is fitted by a cylindrical pin, of which the conical point supports the work; and the back centre can be moved forward by means of the screw, while a clamp screw binds the pin when adjusted. A tenon, entering the groove through the bed, secures the poppet; and a screw descends from the tenon through the bed and projects beneath it. On this screw a nut is tapped, by turning which the shoulder of the poppet is drawn down firmly to the bed, and which, when loosened, allows the poppet to be slid along the bed and adjusted to the length of the work. The point of the back centre must be exactly in the centre line of the axis of the motion of the spindle; consequently, the upper surface of the bed must be straight and level, and the groove exact and parallel. It is necessary, also, that the mandrel should be so fixed to the bed that its centre line is exactly parallel to the bed and to the groove. Its neck must be accurately fitted to the collar; at one end it projects beyond the collar, and the projecting part is formed of a screw for fixing the work to it. Upon this screw various pieces called *chucks* are fixed, each chuck being adapted to hold a different variety of work. The mandrel is turned by a catgut band passing round the pulley and the large iron foot-wheel attached to the end of the axis. This axis has a crank in the middle, united by an iron link to the treadle. Motion is accorded to the lathe by the foot of the workman, which should rise and fall with the treadle, his body remaining steady all the time. Before placing the wood to be rounded in the lathe, it is rounded with a small plane or rasp. Its centres must also be found, so that when the centre points of the poppets are applied to them, they may be exactly opposite each other. When the work is turned and the ends made flat, it is polished; if soft wood, by shark skin or Dutch rushes; if ivory or bone, by pumice-stone or chalk; if metal, by tripoli and putty-powder.

Various tools are used by turners. Gouges are employed to rough out and form the wood; chisels to smooth and reduce it to its proper form. In turning hard woods, ivory, or bone, the cutting edges of the tools are bevelled on one side only. The turner also requires callipers and gauges to regulate the dimensions of his work. Chucks of all sorts and sizes are used; and the milling tool, on which a pattern has been cut, is employed to impress it upon the wood.

The following are the two chief varieties of chuck, both of which are screwed into the mandrel very tightly. By the use of a chuck inside turning is made possible, since the work is supported by one end only. The *screw chuck* has a firm stoutish screw, which turns into the work and holds it firmly, so that a cup or other article involving both outside and inside cutting can be readily turned. But if it is desired to avoid the large hole up the middle of the article turned, which is requisite for the screw of the screw chuck, the *hollow chuck* may be used, a cylindrical box, into which the end of the article to be turned is roughly fitted and driven home with a mallet, or else fixed by screws passing through the rim of the chuck and pressing on the work.

Sometimes elliptical curves or other curves are desired instead of circular ones, as in the familiar "engine-turning" of watch backs, bank-note devices, &c. These are managed by the mandrel being supported on pillars which have a certain freedom of motion, and are under the control of an eccentric, or of a wheel with waved edge. There is an endless variety of such eccentric curves, each one with its appropriate apparatus.

The Plate shows a useful lathe for ordinary work, or for cutting screws when desired. The slide rest, w, is arranged

to travel along the shears, *u*, by means of a longitudinal screw, inside the shears, which works in a nut on the under side of the slide rest. The shaft of the screw projects at *a*, and carries on its end a spur wheel, *b*, by means of which it is driven. A pinion, *c*, is fixed on the projecting end of the chuck spindle, *l*; and this pinion drives the spur wheel, *b*, by means of an intermediate spur wheel, *d*, and pinion, *e*. These latter two are fast together, and are carried loosely on a stud pin, *f*. They may be changed for wheels of various sizes in order to suit whatever rate it is proposed to give the longitudinal motion of the slide rest, as compared with the rotation of the chuck. The stud pin, *f*, is bolted to an adjustable bracket-piece, *g*, which can be so set that it can accommodate the various sizes of the wheels. The slide rest, *w*, may be disconnected from the screw by means of the handle, *h*, and can be shifted along the shears by means of the handle and screw wheel, *j*, which works in the screw inside the shears. The screw, *z*, for moving the tool transversely, has fixed on it a small disc, which is graduated round the edge, so that the operator, with the greatest accuracy, can determine the depth to which he cuts any screw thread he may be at work upon.

**TURNIP** (*Brassica rapa*) is a cruciferous plant belonging to the same genus as the cabbage, cauliflower, rape, &c. It is a native of temperate Europe, whence its cultivation spread in very early times into the temperate parts of Asia. It is frequently found apparently wild in Great Britain on the borders of fields and waste places, but it is probable that such plants are in most cases derived from escapes from cultivation. The turnip is a hardy biennial, with lobed, rough, hairy radical leaves. Under cultivation the root has undergone a remarkable change, being transformed into a large fleshy bulb, which forms a highly esteemed culinary vegetable, and also an excellent food for cattle and sheep. It is cultivated both as a garden and a field crop. The cultivated varieties differ considerably in the shape and colour of the root, which is usually more or less round, but sometimes somewhat oblong or depressed; the flesh varies from white to yellow, and the exterior is sometimes reddish or purplish. As an esculent the turnip was well known to the Greeks and Romans. It appears to have been introduced into this country from Holland in 1550. The turnip, though generally valued highly as a vegetable, is not very nutritious, as it contains from 90 to 92 per cent. of water. The young leaves and buds are dressed as greens under the name of "turnip-tops," and are valued as an anti-scorbutic.

The Swedish Turnip, Swede or Ruta-Baga is a well-known variety of turnip largely cultivated as food for cattle. Its origin is uncertain; it is variously considered as a variety of *Brassica napus* (the rape), or of *Brassica campestris* (the navew), or as a hybrid between *Brassica napus* and *Brassica oleracea* (wild cabbage). It has larger, more elongated roots, with the flesh generally yellow, and the radical leaves are smooth and covered with a bloom like those of the cabbage. The Swedish turnip contains less water in proportion to its weight than the common form. The Teltow turnip, a variety of *Brassica napus*, differs from the common turnip in having a long spindle-shaped root, somewhat resembling a carrot. On the Continent it is extensively cultivated as a culinary esculent.

The cultivation of the turnip as a field crop forms an important part of the most improved systems of agriculture on all light soils. They are the great foundation of all the best systems of cropping, by supplying the manure required for the subsequent crop, and, at the same time, clearing the land of all noxious weeds, by the numerous and large stirrings, and hoeings which they require. Turnips are sown in drills, the seed being deposited near the surface, half an inch of mould to cover

the seed being sufficient. Two pounds of seed per acre are required for the common turnips, and from three to four for Swedes. Bone manure or guano is sown with the seed to accelerate the first growth of the plants.

The early vegetation of the seed is essential to a good crop. In its young and tender state it is liable to a variety of accidents. Its great enemy is the TURNIP-FLY.

In order to have a heavy crop, especially of Swedish turnips, or Ruta Bagas, it is advisable to sow the seed early, that is, in the beginning or middle of May. They will then have the advantage of the summer showers, and be beyond the reach of the fly in a very few days; and when the dry weather sets in they will already have a supply of moisture in their roots, and the fibres having struck deep will not suffer any check.

The common turnip and its varieties should be sown about midsummer, to have a good and heavy crop before winter. The distance at which they may be left in thinning them out must depend on the variety, whether it has a wide-spreading top or not. The best crops, both of Swedes and common field turnips, are generally those which have the tops vigorous and moderately spreading. An interval of from 12 to 15 inches is generally left between each plant.

It is advantageous to have different varieties of turnips, which will come to perfection in succession; and it is useful to sow some at different times for this purpose. The small turnip, which from its rapid growth is called the nimble turnip, may be sown as late as the end of August, and in mild seasons will produce tolerable bulbs in winter and early in spring. The frost will not injure a growing turnip so readily as one which is come to perfection and whose leaves are withered.

There are so many varieties cultivated that it is difficult to enumerate them. The Swedish turnips may be classed according to the colour and size of their tops and the shape of the bulb. The best have but little stem rising from the bulb, and a good tuft of leaves. The substance is of a bright yellow and has a strong smell, especially when they have been kept some time. No frost will hurt them if they are kept dry; but alternate rain and frost will hurt them. The common Norfolk turnip is round and flat, the bulb being half buried in the ground; it throws out no fibres except from the slender root which proceeds from the centre of the bulb. The globe turnip takes its name from its shape; it rises more out of the ground, and grows to a greater size. It is on the whole the most productive and hardy.

In many places, especially on a loose dry soil, the crop is eaten on the ground by sheep which are confined to one part of the field by means of movable fences. But it is generally considered preferable for this purpose to pull the turnips and leave them in heaps on the ground, covered with a thin coating of earth, or to earth them in a trench. Turnips intended for consumption by cattle are stored in broad flat heaps, not exceeding 20 inches in depth, in some dry and sheltered place, and covered with a good coating of straw.

Of late years turnips have suffered much from a disease called *fingers-and-toes* (DACTYLORHIZA), in which the roots become divided and distorted into thick palmated tuberous bodies. The origin of this disease is unknown, and it should not be confounded with ANTHRAX or club-root, which is due to the attacks of a weevil. The turnip crops also suffer from the presence of fungi, the larvæ of insects, snails, and slugs.

**TURNIP-FLY or TURNIP-FLEA** is a name popularly applied to the *Haltica nemorum*, a little beetle which annoys the farmer by destroying his crop of turnips when in the early stages of their growth. The species of the genus *Haltica* are remarkable for their power of leaping, which is effected by means of the peculiar formation of



their very thick hind legs. They are among the smallest of beetles, and are variously coloured with green, brown, or yellow, often brightly shining. Some destroy the cabbage, others flax, others tobacco or hops; but the turnip is the greatest sufferer from the ravages of these little creatures, which, though small in size, are many in number. They love sunshine, warmth, and fine weather, and eat away the surface of the young leaves of the plant with voracity. The larva feeds within the full-grown leaf, in which the egg has been laid and attached by its parent, but does little or no mischief to the growth of the plant. It is the beetle which destroys the first smooth leaves or cotyledons of the turnip. It scents out the turnip crop from a great distance, and flies towards it even against the wind. It feeds by night, and during the day retires under the cotyledon. The parent insects are to be seen in the earliest fine days of February, and do not disappear before the end of October, but they do not feed much after the latter end of September. There are five or six broods of these in a summer. Besides the *Haltica nemorum*, which is about two lines long, of a shining green colour tinged with brown and yellow, the *Haltica similis* and *Haltica flava* are also destructive to turnips.

The name turnip-fly is also sometimes applied to the White or Potherb Butterfly (*Pontia oleracea*), which lays its eggs on the leaves, the substance of which the larvæ devour when hatched. The larvæ of some dipterous insects also infest the roots, stems, and leaves of the turnip. The larva of a moth, *Agrostis Segetum*, sometimes called the Turnip Moth, does much damage by burrowing deeply into the root.

**TURNPIKE TRUSTS.** Turnpike roads were those highways placed by the authority of Acts of Parliament under the management of trustees or commissioners, who were invested with certain powers for the construction, management, and repair of such roads.

By the old laws the repair of all roads fell on the parishes through which they passed, and every turnpike trust was a special exception to this rule created by special Act of Parliament. The object of such trusts was to relieve the parishes through which the great roads passed. A small parish which lay on the road from London to York could not be fairly asked to keep up a road for the endless carriages and horses which were daily passing along such a road for their own purposes. Hence such trusts were empowered to take tolls from those who passed along the road, in order to save the parishes from a charge too heavy for them. The railways of course largely changed this state of things, and the traffic on the great roads became of a more locally beneficial character. There was consequently not the same justice in levying tolls as before, and after much agitation in England on the question of toll-bar abolition, a select committee of the House of Commons recommended, in 1867, that in future legislation the maintenance of all roads should be provided for by a rate levied on districts. This has since been carried out, and turnpikes are now things of the past.

**TURN'SOLE** is a peculiar purple dye obtained from the juice of *Crozophora tinctoria*, an herb of the order Euphorbiaceæ, inhabiting the Mediterranean region. [See *CROZOPHORA*.] The tops of the plants are bruised in a mill, and yield about half their weight of a dark green juice, into which woollen rags are dipped. The latter are then exposed to ammoniacal vapour, and acquire a dark purplish-blue colour. The rags thus prepared are packed and exported, under the name *turnesola en drapcaur*, chiefly to Holland, where they appear to be used largely for the colouring of Dutch cheeses. They are also said to be used for colouring wines, confectionery, &c.

**TURN'STILE**, an ingenious apparatus, used at the entrances of public exhibitions and at the end of toll-paying bridges, which, by a revolving motion, takes a

register of the number of passengers, and the amount received by the money-takers. This machine can only rotate in one direction, and only one person can pass at a time. Until the money-taker presses his foot on a lever the turnstile cannot rotate at all; but directly the passage is effected, the lever is allowed to drop, and the turnstile is again locked. The movement is effected by means of a toothed wheel to the extent of one tooth; and the attendant has to account for the money received according to the number of wheel teeth which have moved during the day.

**TURNSTONE** (*Streptopelia interpres*) is a bird belonging to the PLOVER family (Charadriidae), which is found in almost every part of the globe, but in the United Kingdom occurs only as a winter visitor. It owes its common English name to its habit of turning over stones on the sea-shore with its strong bill in search of food. It breeds in Norway, Greenland, and Iceland, and elsewhere in high northern latitudes, and extends on migration to India, Africa, and Australia. It arrives in England in August from its breeding quarters, and in the southern and western counties many remain for the winter, the rest passing further south; the return migration is in May. It frequents the sea-shore, occasionally visiting the margins of lakes and large rivers. It feeds chiefly on small crustaceans and molluscs. The eggs are four in number, greenish-gray, variously spotted and streaked with ash, blue and brown. The bill is as long as the head, strong, thick at the base, tapering, and slightly bent upwards at the tip, which is rather blunt. The wings are long. The legs are moderate and stout, with the three anterior toes united by a membrane at the base, and the hind toe just reaching the ground. The tail is moderate and rounded. The total length is about 9½ inches. The upper parts are of a reddish-brown colour, spotted with black; the lower surface is white, with part of the neck and breast black.

**TURPENTINE, OIL OF**, a well-known volatile oil obtained on a large scale from the bark and wood of firs and other trees belonging to the natural order Coniferae. The ordinary turpentine oils are obtained from *Pinus maritima*, *Pinus australis*, *Pinus sylvestris*, and *Pinus nigra*. Venice turpentine is from *Larix Europæa*; the oils of juniper, from *Juniperus communis*, and oil of savine, from *Juniperus Sabina*, are also turpentines, and all are obtained from trees or shrubs of the natural order Conifera. The formula is  $C_{10}H_{16}$ . The oils vary in specific gravity, according to the source, from 0.86 to 0.88. The boiling point is about 160° C. (320° Fahr.) All are colourless mobile liquids of disagreeable odour, insoluble in water, but soluble in ether, alcohol, bisulphide of carbon, and oil. They dissolve sulphur and phosphorus and resins, and are much employed for making varnishes. The crude natural oils contain colophony or resin, which remains in the still when the pure turpentine is distilled off. Turpentine is very inflammable, burning with a smoky flame. It takes fire with nitric acid, and also with chlorine, bromine, and iodine. It oxidizes gradually in air, becoming thick and resinous, and developing ozone; hence its use as a disinfectant. In water and oxygen, when exposed to light, it forms a hydrated oxide ( $C_{10}H_{16}O, H_2O$ ), which crystallizes in colourless needles soluble in hot water, alcohol, and ether.

With hydrochloric acid gas it forms three definite hydrochlorates—the solid monohydrochlorate ( $C_{10}H_{15}HCl$ ), the liquid monohydrochlorate, having the same formula, and the dihydrochlorate ( $C_{10}H_{14}^2HCl$ ). The first of these is a remarkable compound known as "artificial camphor." It resembles camphor in odour and appearance, and, like it, is volatile at ordinary temperatures. It melts at 150° C. (239° Fahr.), boils at 165° C. (329° Fahr.), and sublimes in shining scales. It is insoluble in water, but soluble in alcohol and in turpentine. The liquid monohydrochlorate

is a colourless oil, having the specific gravity 1.017. The dihydrochlorate crystallizes in rhombic plates insoluble in water, but soluble in alcohol.

There is also a crystallizable and liquid monohydrobromate ( $C_{10}H_{16}HBr$ ) and a crystalline dihydrobromate ( $H_{10}H_{16}2HBr$ ). Turpentine forms four hydrates with water: these are terpin-hydrate ( $C_{10}H_{16}3H_2O$ ), crystallizing in prisms soluble in water, terpin ( $C_{10}H_{16}2H_2O$ ), terpinol ( $2C_{10}H_{16}H_2O$ ), and terpinin-hydrate ( $C_{10}H_{16}H_2O$ ), a liquid insoluble in water. Terpin crystallizes in needles which melt at  $103^{\circ}$  C. ( $217^{\circ}$  Fahr.) and sublime at  $150^{\circ}$  C. ( $302^{\circ}$  Fahr.) Sulphuric acid dissolves it with red colour, and converts it into ordinary turpentine. Terpinol is a colourless refractory oil, of specific gravity 0.852, and having a pleasant odour. It boils at  $163^{\circ}$  C. ( $334^{\circ}$  Fahr.), and is slightly soluble in water. When turpentine oil is heated with strong sulphuric acid and allowed to stand for twenty-four hours, and the turpentine distilled off, a volatile liquid is obtained. This is isomeric with turpentine, and is called terebene. It is a colourless liquid, having a very agreeable odour of fresh-sawn pine wood. The specific gravity is 0.864, the boiling point  $156^{\circ}$  C. ( $313^{\circ}$  Fahr.) It is much employed in medicine as a powerful but agreeable antiseptic, disinfectant, and deodorizer. The vapour is used as a sedative in phthisis, and the liquid is taken internally in doses of five to thirty drops. Oil of turpentine is also administered internally in doses from 10 drops to half an ounce as a vermifuge, and the French oil of turpentine, in doses of 30 drops every half hour, is the best antidote in cases of poisoning by phosphorus.

**Medical Uses of Turpentine.**—For medical purposes it is re-distilled with caustic alkali, acid matters and traces of resin being thereby removed. It is used both internally and externally. Taken internally it is one of the most efficacious remedies known for the destruction of tape-worms, as it nearly always kills the parasite and then expels it. When used for this purpose it is usually combined with castor-oil and administered in doses of one, two, or three teaspoonfuls, according to the strength of the patient. It is almost equally efficacious over lumbrici or round worms, and used as an enema it will destroy and expel the ascarides or thread-worms which sometimes infest the lower bowel. In addition to its powers as a vermifuge, it is a valuable remedy for all kinds of bleeding, whether it be from the stomach, bowels, lungs, nose, womb, kidneys, or bladder, being given in five-drop doses frequently repeated, where the symptoms are mild, or in one dose of half a teaspoonful where they are urgent. It is also used as a stimulant and diuretic, but it must be used in this way with caution, as it sometimes causes much irritation of the urinary tract. Applied externally it is a speedy and very effective rubefacient, and it is a remedy of great value in inflammatory attacks of the throat, chest, and abdomen. A convenient way of using it, is to dip a piece of flannel in hot water, as hot as the hands will bear, and after wringing it out to sprinkle turpentine on the surface and apply it to the skin. The liniment of turpentine is a powerfully stimulating application, which is of great value, when used with plenty of friction, for stiff joints and in cases of chronic rheumatism.

**TURPENTINE TREE.** See **PISTAGIA**.

**TURQUOISE**, a hydrated phosphate of alumina, coloured green, bluish-green, or blue, by a trace of copper, and valued as an inferior gem. The mineral is somewhat softer than an agate, has a dull waxy lustre, and readily loses its colour on exposure to intense light, heat, or moisture, and when kept near musk or camphor. It is never found crystallized, but occurs in the form of small veins or threads, or as rounded pellets in clayey and sandy rocks, chiefly in Persia and Arabia. The mines of these countries furnish almost all the turquoise for the market, and the stone is the most highly prized gem among the modern

Persians, as it was (under the name of *Callais*) among the ancient Caramanians. A fine series of Arabian specimens, first exhibited in the Great Exhibition of 1851, may be seen in the Museum of Practical Geology, Jermyn Street, London.

**TURRET** (from the Latin *turris*) is used as the diminutive of tower, and denotes that what is so described is small in comparison with the main structure, of which it forms a part. Turrets are frequently attached to one or more of the angles of a tower, and contain a winding stair leading to the roof, and in this position are carried on projecting corbels. Turrets rarely rise from the ground.

**TURRET SHIP.** See **NAVY**.

**TURTAI'OS** (Latin *Tyrtaeus*), son of Archembratos, was the second of the Greek elegiac poets, and perhaps the most renowned martial poet of all times. The information which has come down to us respecting this remarkable man, is for the most part legendary and unreliable. It is related that the Spartans, disheartened at the success of their enemies at the beginning of the second Messenian War, consulted the Delphic oracle, and were directed to ask a leader from Athens; that the Athenians, fearing lest the Lacedæmonians should extend their dominion in the Peloponnese, sent him Turtaios, a lame schoolmaster, in mockery. But he so roused and maintained the courage of the Spartans by his warlike songs and poems on the value of order and discipline, that in the end they obtained a complete victory over their dangerous foes. It is, of course, impossible to say precisely what amount of truth may be contained in the above legend; but it is probable that Turtaios was by birth a stranger, that he became a Spartan by adoption, and that he was not only a great genius in music and poetry, but also something of a statesman. Grote calls him an inestimable ally of the Lacedæmonians during their second struggle with the Messenians; and the few indisputable facts respecting both the first and second war have been gathered from the extant fragments of his poems. The sway which he exercised over the minds of the Spartans must be received as a fact, nor is it in the least inconsistent with the character either of the age or of the people. The musician and the minstrel were the only persons who ever addressed themselves to the feelings of a Lacedæmonian assembly; and we know from other sources that the Spartan mind was particularly susceptible to the influence of music and poetry. It is the present fashion to disbelieve in the legend of the lameness of Turtaios, in his scholastic profession, and even in his Attic nationality, but probably the tradition rests on some basis of fact. The fragments which we possess of these famous battle-songs will be found in Gaisford's "Poetæ Minores Græci," and in many other collections. The best separate edition is that by Bach (Leipzig, 1831).

**TURTLE** (*Cheloniidae*) is a family of reptiles belonging to the order Chelonia (*TORTOISES*). The marine tortoises or turtles are distinguished by having a comparatively depressed carapace, and the limbs adapted for swimming. The limbs are converted into broad flat paddles, the anterior pair being very much longer and larger than the posterior; they are not retractile within the shell.

The turtles are found in all the seas of warm climates, but principally towards the torrid zone. They hardly ever leave the sea, excepting for the purpose of laying their eggs; but some are said to crawl up the shores of desert islands in the night, and clamber up the edges of isolated rocks far out at sea, for the purpose of browsing on certain favourite marine plants. They have been seen in smooth water as far as 700 or 800 leagues from the land, floating motionless on the surface of the sea, as if they were dead, and it has been supposed that they are then asleep. They swim and dive well, and can remain beneath the surface a long time.



In order to reach the destined spot for the deposition of their eggs, the females have often to traverse the sea for more than 50 leagues, and the males accompany them to the sandy beaches of those desert islands selected for the places of nidification. Arrived at the end of their voyage, they thence come forth from the sea after sunset; and as it is necessary to leave the eggs above high-water mark, they have often to drag themselves to a considerable distance before they can hollow out with their hind feet a trench about 1½ feet deep and 2 feet in diameter during the night, and there lay at one sitting to the number of 100 eggs. This laying is repeated thrice, at intervals of two or three weeks. The eggs vary in size, but are spherical, like tennis balls; and when they are laid, their investing membrane is slightly flexible, although covered with a delicate calcareous layer. After slightly covering the nest with light sand, the parent returns to the sea. According to Moseley ("Notes of a Naturalist on Board the Challenger") the eggs require for their development moisture and an equable temperature of no great amount, for the sand in which the hatching takes place feels rather cool to the hand; the notion that the eggs are hatched by means of the direct heat of the tropical sun is therefore erroneous. The eggs are hatched in from eighteen to thirty days; and when the young turtles come out, their shells are not yet formed, and they are white as if blanched. They instinctively make for the sea; but on their road, and as they pause before entering the water, the birds of prey that have been watching for the moment of their appearance hasten to devour them; while those that have escaped their terrestrial persecutors by getting into the sea, have to encounter a host of voracious fishes and ambushed crocodiles.

Those that escape attain, under favourable circumstances, enormous dimensions. Individuals of the genus *Sphargis* have been known to weigh 1500 to 1600 lbs.; and some of the edible turtles, whose carapace has measured in its circumference more than 15 feet and near 7 feet in length, have weighed more than from 800 to 900 lbs. Aged turtles often carry about with them on their carapace a little world of parasites, such as sea mats, tube-worms, barnacles, and acorn-shells; while certain Annelids securely fix themselves at the origin or base of the limbs, where the motion of the turtle cannot displace them.

The food of turtles consists principally of marine plants; but it appears that some of them, especially those which exhale a musky odour (*Thalassochelys caouana*, for instance), feed also on crustaceans and many species of molluscs, the cuttles especially. Their jaws are armed with a strong horny beak, hooked above and below, treacherous on the edges, and most frequently serrated, so as to assist in securing a slippery prey.

In many ways turtles are highly useful to man. The inhabitants of those countries where the turtles grow to a large size do not merely derive from them a supply of food, but they convert their carapaces into boats, into drinking-troughs for their domestic animals, and into baths for their children. As an article of food the Green Turtles (*Tortues franche*s of the French) are so highly prized, that they have become a considerable article of commerce. The fat of many species, when fresh, is used with success in lieu of butter and oil in cookery; and in those species which have a musky odour it is used for embrocations, leather-dressing, and lamp-oil. The imbricated turtles furnish that beautiful article (tortoise-shell), or rather the best sorts of it. The eggs of all the species, particularly those of the green turtles, are excellent food.

One of the most obvious methods of capture is to watch the females as they emerge from the sea to deposit their eggs, and then turn them upon their backs on the hard and dry sand, where they helplessly remain till the captors have secured a sufficient number.\* When the turtles lie

floating on the sea, either for the purposes of sleep or respiration, the turtle-fishers approach them quietly with a sharp harpoon, carrying a ring at the butt-end, to which a cord is attached. The harpooner strikes, and the wounded animal dives, but is at last secured by the cord. In the South Seas skilful divers watch them when so floating, and, getting under the animals, suddenly rise, and so seize them. On the coasts of China and Mozambique turtles are taken by means of the Sucking fish (*Echeneis remora*), which, secured by a long cord, is slipped overboard when in the vicinity of these animals floating at their ease in the water. As soon as the fish perceives one of them he makes towards it, and fixes on to it so firmly as to enable the fishermen to drag it to their boat and secure it.

The Green or Edible Turtle (*Chelonia mydas*) is the most esteemed of all the species for the table. It is especially abundant in the West Indies, whence it extends to the Gulf of Mexico and the coasts of South America; its range is very extensive, for it is found at Ascension Island in the Western Pacific and in the Indian Ocean. In many places it is kept in inclosures to which the tide has access and fattened for the table. As it can subsist for a long time without food it is imported into England alive. The under part of the breast and abdomen is esteemed as a great delicacy; while the green fat is the chief ingredient in the famous turtle soup of city banquets. Its chief food is the Turtle-grass (*Zostera marina*). The carapace of the edible turtle is broad and depressed, covered with disc-shaped horny scales; its colour is generally a dark olive, passing into dingy white. The ordinary length is about 4 feet, but individuals sometimes attain a length of 7 or 8 feet and a weight of 800 lbs.

The Hawksbill Turtle (*Caretta squamata*), found in the Indian and Pacific Oceans, furnishes most of the TORTOISE-SHELL of commerce, derived from the thin imbricating plates covering the carapace. The tortoise-shell is not of great value unless from animals weighing at least 160 lbs., as otherwise it is too thin. Fifteen pounds of tortoise-shell are obtained from the largest animals. This turtle is carnivorous, and the flesh is not esteemed. The name is derived from the long compressed and curved upper jaw, which gives a resemblance to the beak of a hawk.

The Loggerhead (*Phalassochelys caouana*) is found in the warmer parts of the Atlantic, ranging to the Mediterranean. It grows to a very large size, and has a large broad head flattened on the top. It feeds on molluscs and crustaceans, whose shells it crushes with its powerful beak. It is valued only for the large quantity of oil which it furnishes, chiefly used for burning. A very similar species occurs in the Indian Ocean.

The Leather-back or Trunk Turtle (*Sphargis coriacea*) inhabits the Atlantic and Mediterranean, and has occasionally strayed to the coasts of Britain. It is distinguished by having the carapace covered with a dense leathery skin, marked with seven longitudinal ridges. It attains a very large size, individuals having been taken measuring 8 feet in length and weighing from 1500 to 1600 lbs. Its food consists of molluscs, crustaceans, fishes, sea-urchins, and various marine plants. The flesh is not eaten. It utters a loud roaring note when wounded or alarmed.

**TURTLE-DOVE** (*Turtur*) is a genus of PIGEONS (Columbidae) distinguished from the true pigeons by their weaker bill, longer wings, and longer tail. The bill is slender and straight, with the tip slightly arched. The tail consists of twelve feathers, and is considerably rounded or graduated. The toes are long and slender. The turtle-doves are widely distributed in Europe, Asia, and Africa. They are smaller and more graceful in appearance than the common pigeons.

The Common Turtle-Dove (*Turtur communis*) is a summer visitor to Britain, arriving about the end of April or the beginning of May, and is rather more numerous in

the southern counties than further north. It frequents woods, fir plantations, and high thick hedges dividing arable land. It makes a flat nest of a few twigs, which is placed 8 or 10 feet above the ground, in the forked branch of an oak, on a fir-tree, or near the top of a thick and tall bush. The eggs are deposited about the middle of June, and are two in number, of a glossy creamy-white colour. The parent birds sit by turns, the male occasionally also feeding his mate during incubation, and both afterwards mutually labouring for the support of the young. In this country these birds are considered as producing but one brood in the season, but in the south of France they are known to have a second pair of young. Their food is grain, particularly wheat, and they are constant visitors to the wheat-field while the corn is growing, and to pea-fields; they also feed on rape and other small seeds. In the autumn they fly in small parties of ten or twelve birds, and leave this country in September, some remaining at times as late as November. The voice of this species is a tender and mourning cooing. It is widely distributed through Central and Southern Europe, extending to Asia Minor, Palestine, Persia, Northern Africa, Madeira, and the Canary Islands. It is about 11½ inches in length. The upper surface is a light ash-brown; the neck and breast are pale vinous, the under wing-coverts and flanks bluish-gray, and the belly and vent white; the top of the head is of a bluish-ash colour; on each side of the neck there are four rows of black feathers, tipped with white, which form four oblique bars; the wing-coverts are dark brown, with broad reddish-brown margins; the two central tail-feathers are dark brown, tipped with white; the remainder are paler, and the outermost on each side has its external web white.

**TUSCAN ORDER** of architecture, is a debasement by the Romans of the noble Doric order of the Greeks. All the mouldings and proportions were degraded, the fluting was taken from the shaft, and the shaft was made 6 or 7 diameters high; the frieze was ornamented with triglyphs, and the metopes, which were made exactly square, were frequently enriched with bulls' heads. But the great alteration was the introduction of a base, composed usually of a square plinth and large torus, but sometimes merely the usual Attic base. In either case the striking features of the Doric were slurred. Contrast the Doric column in the Plate illustrating the article COLUMN, with the Tuscan columns in Plates I. and III., ROMAN ARCHITECTURE.

**TUSCANY** (*Toscana*), a division of Western Central Italy, formerly a grand-duchy, is situated S. of the main ridge of the Apennines, and between it and the Mediterranean Sea. It is bounded W. by the sea and Modena, N. by Modena, Bologna, and Romagna; E. by Urbino and Perugia; and S. by Viterbo, and partly by the sea. Its area is 9287 square miles, and it has a population of 2,210,000, including the inhabitants of the island of Elba, which is about 5 miles from the mainland. The coast has a length of about 150 miles, and the shore, though sometimes bold, is generally low, and lined by extensive swamps or Maremma. A part of the valley of the upper Tiber belongs to Tuscany, and also a mountainous tract on the northern slope of the Apennines, containing the sources and upper course of a number of streams which flow towards the Adriatic. With this last exception, the waters flow southwards to the Mediterranean.

The surface of Tuscany presents four different regions:—(1) The highlands of the Apennines. (2) The hill-tract, which forms the greater part of the province of Siena, between the valley of the Chiana on one side and that of the Arno on the other, and which slopes on the south-west towards the lowlands of the Maremma. The Ombrone forms the principal drainage of this extensive plateau, which is intersected by rather high ridges, some of which

are ramifications of the great Apennine chain, whilst others, like Monte Amiata and the mountain of Radicofani, are of volcanic formation. (3) The great valley of the Arno, with the lateral valleys of the Chiana, Elsa, Era, and other affluents. This constitutes the finest, most productive, and most densely inhabited part of Tuscany. (4) The maritime plains, or MAREMMA. The climate of Tuscany is on the whole one of the best in Italy, but in the low flats along the shore and near it, in summer, the air becomes charged with the pestilential vapours of the Maremma. In January the thermometer marks 37°, and in August 90° Fahr. Cases of longevity are of frequent occurrence, and the annual mortality, never so high as 1 in 36, often does not exceed 1 in 40 of the population.

More than half of Tuscany is planted with vines, olive trees, and chestnut trees, which afford food to the population of the mountains, or forests, and nearly all the remainder is pasture or arable land.

The principal articles of produce are—wine, oil, and silk, but maize, wheat, rye, and barley are also grown to a very considerable extent. The other articles of native produce exported are—fruit of various sorts, lamb and kid skins, potash, timber, cork, juniper berries, marble and alabaster, iron from Elba, borax, sulphur, alum, and anchovies, which are fished off the coast. Nearly the whole trade of Tuscany with other countries is carried on through the port of LEGHORN. Horned cattle are not very numerous: most of the flocks migrate in the autumn from the highlands, to pass the winter in the Maremma. The wool is of an inferior description, and only suitable for the commonest purposes. Goats are kept in large numbers, and yield a milk which is highly prized for making cheese.

The mineral products are—iron, from the island of Elba, the ore of which is smelted and cast on the mainland, at Cecina, Valpiana, and Follonica; copper, lead, marble, sulphur, rock-salt, alabaster, and alum. *Sassol* is made chiefly in Elba.

The manufactures of Tuscany consist of woollen, hempen, and linen cloths; woollen caps for the Levant; silk stuffs, paper, glass, leather, wax; coral, which is gathered on the coast of Barbary and worked at Leghorn; iron-ware, alabaster vases, and other ornaments, wrought at Volterra; china and delft ware.

For administrative purposes Tuscany is divided into the following districts, each forming a province of the kingdom of Italy:—Arezzo, Florence, Grosseto, Livorno or Leghorn, Lucca, Pisa, and Siena. The chief town is FLORENCE.

*History.*—The ancient history of Tuscany is included in that of Etruria, of which it formed the northern part. It was afterwards comprehended in the great Lombard kingdom, and when the latter fell before Charlemagne, was created into a marquise, to which Boniface was appointed (818). This earlier line of marquises of Tuscany ended infamously. Guido, marquis in 925, married the scandalous creature Marozia, daughter, mistress, mother, and murderess of popes, and the real ruler of Rome. He assisted this abominable woman in the murder of Pope John X. in 928, to clear the way for the election of her son, who became pope as John XI. in 931. By her influence he had become king of Burgundy in 926, but he died, possibly by unfair means, in 929, and his half-brother Hugo, who had risen to be king of Italy, married the widow. The marquise of Tuscany passed to Guido's brother Lambert; but King Hugo seized and blinded him, and gave the duchy to his own brother Bosco in 931. Thence arose the second line, culminating in Bonifazio the Pious, created Duke and Marquis of Tuscany by the Emperor Conrad in 1027. His daughter and heiress, the illustrious Countess Matilda, so well known for her devotion, bequeathed the southern districts of her dominions to the Pope, and they were accordingly annexed to the papal states in 1115, not without dispute on the part of the

emperor. In the northern part (then called Tuscia) gradually grew into prosperity various flourishing cities, as FLORENCE, PISA, LUCCA, and SIENA. Pisa and Lucca at once threw off their allegiance on the countess's death. Florence became an independent republic about 1198, and in due time incorporated the whole of Tuscany in her domains. Pisa maintained a long and vigorous resistance, but eventually submitted to her wealthier and more powerful neighbour in 1406. Siena fell to Florence in 1557.

The Florentine republic, though still nominally independent, was under the government of the Medici family, from 1420, when that extraordinary family first rose into importance, until 1530. At this date it signed the death-warrant of its liberties by appointing Alessandro de' Medici perpetual governor or duke. His son, Cosimo or Cosmo, converted the government into an hereditary monarchy as the Grand Duchy of Tuscany, 1569.

The grand-ducal crown remained in the Medici family until its extinction (after giving the State seven grand dukes), by the death of Giovanni Gastone, in 1737, when, by the treaty of Vienna, it was bestowed upon Francis duke of Lorraine (1737-65), who had married Maria Theresa (afterwards Empress of Germany), in return for his cession of his hereditary states to France, which required them as an appanage for the deposed King of Poland.

Francis, the first Bourbon grand-duke, was succeeded by his son (afterwards Emperor) Leopold I. (1765-90). Ferdinand III., son of the Emperor Leopold, became Grand-duke of Tuscany in 1790. When Napoleon conquered Italy in 1799, the grand-duke was forced to flee, and his dominions were conferred by the conqueror upon Louis, duke of Parma, with the new title of King of Etruria. He reigned but two years, and was succeeded by his son, Louis II., in 1803. This phantom sovereignty was soon swept away by its creator, and Tuscany annexed in 1808 to the French Empire. In the following year the emperor appointed his sister, Eliza Bonaparte, grand-duchess, and she maintained a brilliant court at Florence, until the fall of Napoleon remodelled the map of Europe, and Ferdinand III. (1790-1824), the legitimate prince, was restored to his throne (1814).

It is an old saying that the Bourbons learn nothing by misfortune, and under their rule in Tuscany, from the first Francis onwards, the country made but little progress in the development of her resources. They ruled tyrannically, and showed themselves ever inimical to freedom of speech and the cultivation of those arts which freemen love. They were accordingly regarded with a deep hatred and loathing by their subjects, and the more so because they were in effect Austrian satraps, who obeyed the orders issued from Vienna, and helped to maintain Austrian influence in Italy.

In the year of revolutions, 1848, Leopold II. (1824-59), the son of Ferdinand III. endeavoured to propitiate his subjects, and arrest the progress of the revolutionary spirit by granting them a free constitution; but his new-born liberality was necessarily regarded with suspicion. An insurrection broke out at Florence on the 11th of February, 1849, and the duke was compelled to fly. A republic was proclaimed, but the condition of affairs was not then favourable for the realization of the long-cherished Italian dream of liberty and unity; and in July, 1850, an Austrian army restored Duke Leopold to his throne.

The war between France and Austria in 1859 afforded Italy the opportunity she had so long waited for. The Italians saw in Piedmont a *point d'appui* for their resistance against the Austrian power, and in Victor Emmanuel a gallant ruler for a constitutional kingdom. Tuscany rose in arms, and the Tuscan army demanded an alliance with the Sardinians, proclaiming Victor Emmanuel dictator. Duke Leopold retired to Bologna, and in May the Sardinian commissary, Buoncompagni, assumed the provisional govern-

ment. By abdicating in favour of his son, Ferdinand IV., the grand-duke hoped to secure the throne in his family, but the Tuscans were determined upon forming part of a free Italy, and of wholly ridding themselves of the Bourbon tyranny. In September, 1859, the Constituent Assembly voted the annexation of their state to Piedmont, a vote confirmed on the 12th of March by universal suffrage; and on the 26th, Prince Eugene of Savoy-Carignan was appointed governor. A decree of the King of Italy in December, 1861, named Florence the capital of Italy, and such it remained until the new kingdom was finally consolidated, and the edifice securely crowned by the removal, in 1870, of the seat of government to its only permanent and legitimate centre, imperial Rome.

**TUSCULUM**, familiar to classical students as the place where Cicero's country house (*villa*) was situated, lay about 10 miles south-east of Rome among the Alban Hills, then called Tusculan Hills, from the name of the town. It was of ancient foundation, deriving itself from Telegonos, the son of Odysseus (Ulysses) by the sorceress Kirke, and was one of the first Latin towns to rise to great fortune. Later it fell under the power of Rome, and became a favourite country residence for the statesmen of the great city. Cato the Elder was a native of Tusculum. The ruins of the town are still discernible 2 miles above Frascati.

**TUS'SAC GRASS** (*Dactylis cespitosa*) is a grass belonging to the same genus as the COCK'S-FOOT GRASS (*Dactylis glomerata*). It is a native of the Falkland Isles, and is remarkable for growing in great tufts, 5 or 6 feet high, with long tapering leaves, frequently 8 feet in length, whose tops bend over in graceful curves. It furnishes a good fodder for horses and cattle generally, and has been successfully introduced into the Hebrides and Orkneys. It succeeds only in peaty soil, and in localities exposed to the sea breeze. The young shoots are boiled and eaten as asparagus; while the inner part of the stem, which is said to resemble the hazel nut in flavour, is also eaten by the natives.

**TUSSEK, THOMAS**, was born at Rivenhall, near Witham, in Essex, probably about 1515. He was taught singing at an early age, and became a chorister in the collegiate chapel of Wallingford Castle, whence he was removed by impressment for the service of St. Paul's. Later on he was sent to Eton, and gained a scholarship at Cambridge. He came to court under the patronage of Lord Paget. When he had spent fourteen years at court, probably engaged in his musical capacity, he married, and became a farmer at Katwade, now Cattiwade, in Suffolk, where he wrote "A Hundreth Good Pointes of Husbandrie," the first edition of which appeared in 1557. After several other changes of residence, and marrying a second time, he returned to London, whence, about 1574, he went to Trinity College, Cambridge, in order to escape from the plague. He is supposed to have returned to London, where he died about 1580. After passing through several editions, his work appeared in an enlarged form as "Five Hundreth Pointes of Good Husbandrie," in 1573, and was many times reprinted with various alterations. The life of the author, which forms by no means the least amusing part of the book, appears to have been first printed with the edition of 1573. With its variety of metre, or jingle, and its homely and quaint detail, Tussek's work is an interesting memorial of the rustic England of the olden time. This old English Georgic has much more of the simplicity of Hesiod than of the elegance of Virgil; and a modern reader would suspect that many of its salutary maxims originally decorated the margins and illustrated the calendars of an ancient almanack. It is without invocations, digressions, and descriptions; no pleasing pictures of rural imagery are drawn from meadows covered with flocks and fields waving with corn, nor are Pan and Ceres once named. Yet it is valuable as a genuine picture

of the agriculture, the rural arts, and the domestic economy and customs of our industrious ancestors.

**TUSSILAGO** is a genus of plants belonging to the order *COMPOSITÆ*, having large solitary flower-heads; the florets of the ray are female, narrowly ligulate, in many rows, those of the disc are male, tubular, five-cleft; the receptacle is naked. The species are natives of Europe and America.

*Tussilago farfara* (common coltsfoot) is found in moist, chalky, and clay soils in Britain and throughout Europe. Its flowers come up in March and April, and have often disappeared before the leaves ascend from the ground. They are bright yellow, borne solitary on an erect flower-stalk from 4 to 6 inches high. This plant from the earliest times has had a great reputation for the relief of asthma and coughs. The part used is the leaves, which are very large, broadly heart-shaped, angular, and clothed on the under surface with a dense white cottony down. They are mucilaginous, astringent, and slightly bitter, and are used either in infusion or decoction, or dried and smoked like tobacco. The plant is not often used now by the medical practitioner.

*Tussilago petasites* (common butter-bur) is very abundant in wet meadows and by river sides. This plant produces the largest leaves of any in Great Britain, sometimes measuring 3 feet broad. The flower-heads are in panicles. It is sometimes made the type of a distinct genus, *Petasites*.

*Tussilago or Petasites fragrans* (fragrant coltsfoot) blossoms early, has a sweet scent, and has found very generally a place in gardens. It is a native of the south of Europe, but has been established in some parts of the south of England. The flowers of all these plants are favourites with bees.

**TUTBURY**, a market-town, about 22 miles east by north from Stafford, 4½ W.N.W. by railway from Burton-on-Trent, and 129 from London, is situated on the slope of a hill overlooking the romantic valley of the Dove. The ruins of Tutbury Castle, formerly a place of great magnitude and strength, are situated on the brow of the acclivity. The castle was once the residence of the Merian kings, and afterwards of the earls and dukes of Lancaster. Mary Queen of Scots was confined in it in 1569-70, and from 1584 to 1586. The church is the nave of a much larger building founded in 1080, and affords some fine specimens of Norman work. There are some cotton mills and extensive glass works. The population in 1881 was 2306.

**TUTICORIN** (*Tutukudi*), a municipal town and seaport in Tinnevely District, Madras, British India. The appearance of the place and of its neighbourhood is very unattractive. In parts the subsoil is so thin that no trees or plants will grow, and elsewhere there is nothing but heavy sand with palmyra-palms and a few bushes. During the south-west monsoon the dust is intolerable. Although the annual rainfall is scanty, a heavy shower causes much inconvenience from want of drainage. Tuticorin seems to have been formerly a more important place than at present. In 1700, the Jesuits spoke of it as having 50,000 inhabitants. From the Portuguese it passed to the Dutch in the seventeenth century, and was lost by them, with Negapatam and other possessions, when war broke out with the English in 1781. There are several Catholic churches and a convent of European nuns. In the value of its foreign trade, Tuticorin stands second in the Madras presidency, and sixth in all India. Trade has much increased since the opening of the South Indian Railway, of which Tuticorin is a terminus. The chief exports are cotton, coconuts, paddy, chillies, &c. Much grain, as well as cattle, horses, sheep, and poultry, are sent to Ceylon, with which there is also a considerable passenger traffic. The harbour is well sheltered, but only 8 feet deep; ships have to anchor 2½ miles from the shore, and the cargo is

brought out in boats carrying 20 tons. The water supply is derived from the Tambraparni River, being brought from a reservoir 4 miles distant in open channels and masonry conduits, and stored in dipping-wells and tanks. It becomes polluted on the way, and the supply sometimes fails. The local wells are all salt. The population is about 10,000.

**TUTOR.** By the Roman law a male under the age of fourteen, and a female under the age of twelve, were called *impuberes*. A male who was impubes was incapable of doing any legal act by which he might be injured; his property was under the care of a tutor, who was so called from his office of defending or protecting (*tundo*) the impubes in the transactions which were necessary for the administration of his property. The office of the tutor was *tutela*; and the impubes, who with respect to his tutor was called *pupillus*, was said to be *in tutela*, in tutelage. The tutor's business was to manage the property of his pupillus, and to add to his acts the legal sanction (*auctoritas*). When the pupillus attained the age of puberty, he had the capacity of contracting marriage, and of doing other legal acts, and was freed from the control of his tutor. But though the law gave full legal capacity to the pupillus on his attaining puberty, it still gave him some further protection until he was twenty-five years of age.

The passage from the guardianship of property to the guardianship of intellect and character, marking the modern relation of tutor and pupil, is self-evident.

**TUTSAN.** See HYPERICUM.

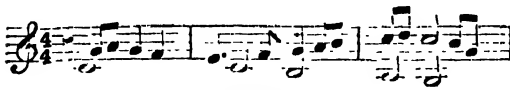
**TUTTI** (Ital., all), in music, a direction indicating that from the place to which it is affixed all the instruments are to play together. The term is chiefly used in concertos, where the solo instrument has had a long passage, and the band now comes in, or in concerted pieces where the choros is heard after having been silent for some time, and in similar passages. Hence it often figures as a noun, and critics speak of the "opening tutti," the "second tutti," &c., of any concerto they may be referring to.

**TWEED**, the second river of Scotland, rises at an elevation of 1500 feet, in the moor of Tweed-slaws, among the Moffat Hills, at the south extremity of the county of Peebles, descending 1000 feet in this distance, and thence to the English boundary the course is generally east. A little above Coldstream it begins to divide England from Scotland; and continuing hence along the border, again in a north-east direction, enters the North Sea at Berwick, after a course of 96 miles. Area of basin, 1870 square miles. The tide ascends 10 miles, but the river cannot be passed for more than six of these by vessels above 30 tons burden, thus singularly contrasting with the Clyde and Forth.

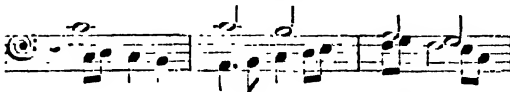
**TWELFTH**, in music, is the interval of the Octave-Fifth, the third note in the series of partial tones. It is one of the most perfect of consonances, ranking between the octave and the double-octave or Fifteenth. Helmholtz styles it (with these other two) an *absolute* consonance, the Fifth and Fourth being, in his view, *perfect* consonances. The reason of the superiority of the interval of the Twelfth lies in the fact that all the partial tones of the upper note coincide absolutely with every third partial of the lower note and reinforce it, while in the case of the Fifth every alternate partial of the upper note is dissonant with the partials of the lower note. The well-known organ stop called the Twelfth is based upon this principle, and when used it melts into the tone which is being played a Twelfth beneath it, and so is not heard individually if the prime tone is strong enough, though its effect is remarkable in brightening the tone. The Twelfth must not be used over a soft combination, which will not be strong enough to overpower its individuality.

The Twelfth is one of the intervals at which double or invertible counts point is written, and though it is difficult,

being much hampered by restrictions, yet the effects produced are so much fresher and more unexpected than those of ordinary double counterpoint (at the Octave), that it is well worth the trouble it gives to write it. The following fragments of a double counterpoint at the Twelfth (on the tune "Old Hundredth") are taken from Macfarren's counterpoint:—



Counterpoint above Melody.



Counterpoint below Melody, inverted by a Twelfth.

**TWELFTH DAY**, the twelfth day after Christmas, and the festival of the Epiphany, or manifestation of Christ to the Gentiles. It was formerly one of our great English holidays, and the occasion of several curious popular ceremonies. In commemoration of the traditional visit of the three magi, or kings Melchior, Jaspas, and Balthazar, to the infant Christ, a play or "mystery" was wont to be publicly performed. It was also customary for the sovereign, either in person or through his chamberlain, to deposit on the sacred altar a gift of gold, myrrh, and frankincense, the legendary gifts of the three kings. Another mode of commemoration was the election of kings by beans. For this purpose a great cake was made in every household, and a pea and a bean were concealed in it. After it had been baked, it was divided into as many portions as there were members in a family, and each drew his share by lot. Whoever selected the bean was declared king, whoever received the pea became queen, and the two sovereigns afterwards appointed the various officers of their mimic court, and presided over the festivities of the court. Herrick has celebrated the custom:—

"Now, now the mirth comes,  
With the cake full of plums,  
Where *beast*'s the king of the sport here;  
Beside we must now,  
The pea also  
Must revell as queens in the court here."  
—"Twelve Night," &c.

Twelfth Day is now almost forgotten, the most recent relic of all its past splendours being the "Twelfth Cakes," whose sugared tops and quaint decorations made such a show in our confectioners' windows. By the change of style in our calendars, involving the loss of eleven days, Twelfth Day is Old Christmas Day. No doubt its long survival as a festival is in great part due to this circumstance.

**TWELVE TABLES, LAWS OF THE.** One of the great grievances of the plebs in the early Roman republic was the absence of laws. The magistrates acted under the sanctity of their oath as they thought right, and no man was sure what their decision would be in a given case. After the great secession and the establishment of the tribunate the question of a state code could no longer be deferred, and in 451 B.C. an embassy was sent to Greece to collect the chief codes, including the famous laws of Solon. On the return of the embassy a committee of ten (*Decemviri*) was appointed, who in B.C. 451 set to work to

draw up a code [see *DECEMVIRI*]; and that they might be free from control, the supreme powers were given over to them for the year. The laws which were drawn up were engraved on ten tables of copper and affixed to the rostra or hustings in the forum, in face of the senate-house. But a supplement being necessary, *decemvirs* were again nominated for B.C. 450, and these produced two more tables of laws. Thus arose the famous laws of the twelve tables, which have ever since formed the basis for the legislation of the world.

**TWER**, the capital of the government of the same name, in Russia, stands on the right bank of the Volga, over which there is a bridge, and which is here joined by the Twerza and the Tmaka. The town is the only one of importance on the railway from St. Petersburg to Moscow; and as the Volga is navigable for steamers up to it, it is a place of great commercial importance. Twer is surrounded with palisades, which are closed by barriers, and consists of three parts: the fortress, lying between the Volga and the Tmaka, which is encircled with a rampart; the city, which is divided by the rivers into four parts, united by three bridges; and a suburb. The town is regularly and well built, and has a cathedral, numerous churches, two convents, bazaar, palace, theatre, founding asylum, hospital, gymnasium, and an ecclesiastical seminary. Twer has 20,000 inhabitants, who manufacture cotton, linen, leather, hardware, especially nails, and candles, and carry on an extensive transit trade.

**TWICK ENHAM**, a town of England, in Middlesex, on the banks of the Thames, 11 miles W.S.W. of St. Paul's, London. It has been the residence of numerous celebrities, including Pope, Horace Walpole, and Louis Philippe. There are several churches, of which St. Mary's is of some antiquity, a town hall, Friary, the Royal Naval School, and the Police Orphanage. The population in 1881 was 12,479.

The meaning of the name has proved an insoluble problem. It occurs as early as 701. The manor was originally part of Isleworth. In the reign of Henry VIII. it was annexed to Hampton Court. Charles I. gave it to his queen. It was leased and sub-leased, and though still nominally crown land, is held by several private owners. The manor house is close to the church. Here Katharine of Aragon is said to have lived after her divorce.

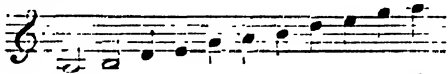
**TWILIGHT** (German, *Zwöllich*), the name given to the light which remains after the sun has set, or which is seen immediately before he rises. The twilight, which is light reflected from the higher strata of the atmosphere, begins or ends at the time when the sun is at a certain depression below the horizon, the depression depending upon the state of the atmosphere for the time being. In the fogs of winter, darkness comes on almost immediately after sunset, while on a clear summer evening the broad light of day will continue for more than an hour in our latitude. In tropical climates the sun descends and ascends almost perpendicularly to the horizon, and therefore his apparent motion is so rapid that the interval between light and darkness is very short; whereas, in higher latitudes, he sets and rises more obliquely to the horizon. This causes his vertical descent and ascent to be more slowly made, and thus the duration of twilight is increased; the increase of duration is in fact apparently greater than the actual truth, in consequence of the pupil of the eye having time to accommodate itself to the gradually diminishing quantity of light.

**TWIN CRYSTALS**, as the name implies, are crystals or reversed half-crystals, intimately united in pairs. Sometimes the two crystals are joined so as to form an angle, like a bended knee, and are then termed *geniculated twins*; and occasionally two of these meet to form a complete cross, as in *Silicrolite*. In the case of united half-crystals the one half is placed in a position reverse of that

of the other, having apparently been completely twisted round, as may commonly be observed in FELSPAR. The large crystals of the latter mineral often consist of several such twins fused together, and this is the reason of the alternating banded colouration to be noticed when their sections are examined with the polariscope.

**TWINING PLANTS** are defined by Darwin ("Movements and Habits of Climbing Plants") as those climbing plants which ascend to a height by twining spirally round a support, and are not aided by any other movement. [See CLIMBING PLANTS.] The stems of twining plants are composed of long, slender internodes, the youngest of which are constantly performing a revolving movement of *circumnutation*, due to unequal growth on different sides of the internode. When the revolving shoot meets with a vertical support its motion is arrested at the point of contact, but the free projecting portion continues to revolve till it is again brought into contact with the support, and in this way the shoot winds in spiral coils round the latter. The coils formed are nearly horizontal when the support is thick, and become more nearly vertical when the latter is thin. Hence most twining plants cannot ascend thick trees, while they will twine round an object as thin as a thread. The twining of plants is usually in an opposite direction to the course of the sun, from right to left, but some, as the hop and honeysuckle, twine from left to right. As the stem twines round the support it undergoes torsion around its own axis. When the support is relatively thick and rough, the direction of torsion is opposite to that of coiling. The movements of twining internodes are more energetic when the external conditions of growth are favourable. See MOVEMENTS OF PLANTS.

**TY**, the principal Chinese flute. It is usually made of bamboo, with ivory tips, and has ten finger-holes and two mouth-holes. One of the mouth-holes is situated nearer to the centre of the tube than the other and gives a higher pitch. The mouth-hole not in use is protected by a thin film, and the same method is usually employed to silence two of the finger-holes, having the pentatonic scale alone producible. If the diatonic scale is desired all the holes are used. The following is the scale of the ty in the actual pitch:—



The first two notes, written as minims, are producible by means of two extra finger-holes placed opposite to each other at the further end. There is a small ty also in use, the pitch of which is of course higher.

The ty is played crosswise, like our concert-flutes; but the other Chinese flutes are blown from the end, the edges being left sharp.

**TYBURN**, familiar till a century since as the place for hanging criminals condemned at Newgate, in London, was at the present western extremity of Oxford Street, then called Tyburn Road, near the corner of Hyde Park. The "Ty" burn was a small stream running at that time from Hampstead through St. James's Park to the Thames, and has long since disappeared. In 1783 the criminals were ordered to be hung at Newgate instead of being taken to Tyburn.

**TYCHO BRAHÉ**. See BRAHÉ.

**TYCOON**, the Chinese and more familiar name of the hereditary prime minister of Japan, accurately called *Shingon*, who, until the revolution of 1868 swept away most of the ancient régime and customs, performed all the duties of sovereignty, and held much the same relation to the Mikado, or sacred emperor, as did the mayor of the palace (*maire du palais*) to the Karling kings of France. See JAPAN.

**TYDEUS, TYDIDES**. See TUDEUS, &c.

**TYLOPH'ORA** is a genus of plants belonging to the order ASCLEPIADEÆ. The species form twining herbs or shrubs, with small unbellate flowers. They are natives of the tropical and warmer regions of the Old World. *Tylophora asthmatica*, a native of India, Ceylon, and the Moluccas, has a high reputation as a medicinal plant. The root acts as an emetic, and is frequently employed in India as a substitute for ipecacuanha, and is also used as a remedy in dysentery.

**TYMPANUM**, (1) the drum of the E.Æ. (2) A sort of tambourine-drum used by the ancient Romans, the *TUMPAION* of the Greeks.

**TYNDALE** or **TINDAL, WILLIAM**, the Protestant martyr and translator of the Scriptures, was born at Hunts Court, North Nibley, in Gloucestershire, in 1477, or, according to some authorities, in 1484. He entered Oxford University at an early age, and after taking his degree, removed to Cambridge to complete his education. In March, 1502, he was ordained, and soon afterwards became a friar in the monastery of Greenwich. About this time he would seem to have begun those biblical studies which influenced so largely his after-career; and probably he had already become acquainted with the leading doctrines of Luther, of which he was soon to be a powerful defender. In 1522 he entered the household of Sir John Welsh, a Gloucestershire knight, as tutor, where he translated the "*Enchiridion Militis*" of Erasmus, and dedicated it to his patron. He frequently preached in the surrounding villages, openly avowing his sympathy with the Lutherans, and entering into verbal combats with the Romish priests that caused him to fall under suspicion of "heresy." Cherishing a keen desire that every Englishman should be able to read the word of God in his native tongue, he betook himself to London for the purpose of translating the New Testament. Disappointed in his hope of securing the protection of Tunstall, the learned Bishop of London, he found an asylum in the house of wealthy Alderman Humphrey Monmouth, whose heart and soul were in the great good work. Here he was hospitably entertained for six months, and when, in 1523, he went abroad, Monmouth generously settled upon him an annual allowance of £10—a much greater sum of money in those days than it is in ours.

In Germany Tyndale had an interview with Luther; and at Worms he published his "New Testament," about 1525 or 1526. Copies were poured out by hundreds from the foreign presses, and the flood of light soon flowed into England, spreading from north to south, and east to west. Tunstall immediately prohibited their sale, threatening sellers and buyers alike with the terrors of excommunication, and purchasing all he could lay hands upon in order to consign them to the flames. The money thus disbursed, however, supplied Tyndale with the funds he stood in need of, and enabled him to print additional supplies. His brother and two friends were sentenced, for distributing these, to pay a fine of £18,840 0s. 10d., and condemned to ride on horseback, facing the horse's tail, as far as Cheapside, where the *auto-da-fé* was regularly celebrated. Sir Thomas More was next enlisted against the dangerous heretic, and attacked him with exceeding virulence, strangely in discordance with his ordinarily sweet and generous disposition—such changes are wrought in a man's nature by the bigotry of religious zeal.

In 1528 Tyndale published his "Obedience of a Christian Man," which was followed, in 1530, by his translation of the "Five Books of Moses." In his version of *Genesis* he was assisted by Miles Coverdale. In the same year he gave to the world a bitter onslaught on the vices of the Roman Catholic prelate in his "*Practice of Prelates*," which appears to have roused the especial wrath of Henry VIII. Tyndale's enemies now endeavoured by various devices to entrap him into visiting England, but well assured



that he would immediately be arrested and burnt as a heretic, he remained quiet at Antwerp, prosecuting his studies, acting as chaplain to the company of English merchants, and engaged in a careful revision of his "New Testament," "which," he says in the preface, "I have looked over again with all diligence, and compared with the Greek, and have wedded out of it many faults." From the reprint made by Bagster in 1836 we extract a passage, which the reader may compare with an extract from Wyclif's version which is given in our life of that great reformer. See WYCLIF.

"Jesus answered and sayde: A certayne man descended from Jerusalem into Jericho. And fell into the hondes of theves, whych robbed hym off his raiment and wonded hym, and departed, levyng hym halfe deed. And it chaunced that there cam a certayne preste that same way, and saw him and passed by. And lykewyse a levite when he was come nye to the place went and lokod on hym, and passed by. Then a certayne Samaritayne as he iornyd cam nye unto hym, and behelde hym, and had compassion on hym, and cam to hym and bounde uppe hys wondes, and poured in wyne and oyle, and layed hym on his beaste and brought hym to a comon hostry, and drest hym. And on the morowe when he departed he toke out two pence and gave them to the host and said unto him, Take care of him, and what-soever thou spendest above this when I come agayne I will recompence the. Which now of these thre thinkest thou was neighbour unto him that fell into the theves hondes? And he answered, He that shewed mercy on hym. Then sayd Jesus unto hym, God do thou lykewyse."

At length, through the treachery of a spy named Henry Phillips, Tyndale was arrested, conveyed to Vilvoorde, and flung into prison. The only personal relic known of Tyndale is a letter in Latin, written during this period, in which he speaks of suffering extremely from cold, and requests that a few of his clothes may be sent him, that he might be allowed to have a candle in his cell in the evening, and above all, that he might be permitted to continue his studies of the Old Testament. After two years' imprisonment he was brought to trial, and after a travesty of justice, the judges being already determined on his conviction, was sentenced to death as a heretic. On Friday, 6th October, 1536, he was chained to the stake, strangled, and burned to ashes, his last words being the prayer: "Lord, open the King of England's eyes!" His life was not given in vain, for in the following year the Bible was published by royal command, and placed in every church, for the benefit of the common people, and the present Authorized Version is closely based on the translation executed by William Tyndale. He was a man of great simplicity, of winning manners, of abstemious habits, of untiring industry, and fervent piety. Even the imperial procurator who prosecuted him, calls him *homo doctus, pius, et bonus*. The works of Tyndale and Frith, his assistant, collected and published after the Reformation was established, were issued in London, in 1831, in three vols. 8vo, edited by T. Russell, A.M., and by the Parker Society in 1848-50. An edition of Tyndale's New Testament was published in London in 1836, and more recently, an edition of Tyndale's translation of the Pentateuch, carefully and exhaustively edited by Rev. T. J. Mombert, D.D., an American scholar, was issued in New York and also in London by Messrs. Samuel Bagster & Sons.

A memorial was erected to Tyndale at Nibley Knoll, Gloucestershire, in 1866, and an excellent statue of the great translator now adorns the Thames Embankment of London. See also "William Tyndale, a Biography," by the Rev. R. Demans, M.A.

**TYNDALL, JOHN**, an eminent British physicist, was born at Leighton Bridge, County Carlow, Ireland, in 1820. He was for some time engaged in the Ordnance

Survey of the United Kingdom, and after prosecuting his studies in Germany directed his attention specially to the phenomena of molecular physics and their connection with diamagnetism. In 1853 he was appointed professor of natural philosophy at the Royal Institution. Tyndall first visited Switzerland in 1849, and in company with Professor Huxley made a second journey in 1856, since which he has visited the Alps every year. In the winter of 1859 he succeeded in establishing himself on the Montanvert, and determined the rate of winter motion of the Mer de Glace. With the co-operation of Dr. Frankland, he planted several thermometric stations on the slopes and summit of Mont Blanc, and made numerous observations relating to combustion at great altitudes. In 1861 he scaled the hitherto inaccessible peak of the Weisshorn, and in 1868 reached the summit of the Matterhorn, crossing it from Breuil to Zermatt. The results of his glacial investigations were published in the *Philosophical Transactions* (jointly with Professor Huxley's) for 1858, and subsequently in "Glaciers of the Alps" (London, 1860), and "Hours of Exercise in the Alps" (1871). He opposed the views of Agassiz respecting the occurrence of laminae in glaciers, definitely ascribing the true cause of their formation to mechanical pressure. Through the direct application of the doctrine of regelation, he arrived at a satisfactory understanding of the nature of glacial motion, proving, by carefully repeated observations on the structure and properties of ice, the inefficiency of the generally admitted plastic theory to account for that phenomenon. This discovery led to a protracted controversy with Professor (afterwards Principal) Forbes of Edinburgh. In 1863 he published "Heat Considered as a Mode of Motion," which placed him in the front rank of scientific discoverers. In 1866 he relieved Faraday in his duties at the Trinity House, and on the death of that philosopher in 1867 became superintendent of the Royal Institution. Tyndall visited the United States in 1872, and delivered a course of lectures in some of the principal cities of the east, the proceeds of which (nearly £3000) were given to the establishment of a fund designed for promoting the study of the natural sciences in America. In 1871, while presiding over the annual meeting of the British Association, he delivered the famous inaugural known as the "Belfast Address," which was denounced as a declaration of materialism. For many years Tyndall's labours were more generally related to those of the Trinity House, in connection with inquiries made into the causes which affect the acoustic transparency of the atmosphere, and as to the best system of lighting for lighthouses. He resigned these appointments in 1883. He is a strenuous advocate of evolution. His vigorous language and felicitous method of exposition have given him the highest position among scientific lecturers. Besides the works already mentioned, he has published "Mountaineering in 1861" (1862); "Radiation" (1865); "Sound, a Course of Eight Lectures" (1867; third edition, embracing his important observations on acoustic equality, 1875); "Faraday as a Discoverer" (1868); "Natural Philosophy in Easy Lessons" (1869); "Notes of a Course of Nine Lectures on Light" (1870); "Researches on Diamagnetism and Magneto-crystalline Action" (1870); "Notes of a Course of Seven Lectures on Electrical Phenomena and Theories" (1870); "Essays on the Use and Limit of the Imagination in Science" (1870); "Fragments of Science for Unscientific People" (1871); "The Forms of Water in Clouds and Rivers, Ice and Glaciers" (1872); "Contributions to Molecular Physics in the Domain of Radiant Heat" (1872); "On the Transmission of Sound by the Atmosphere" (1874); "Fermentation;" (1877); "Lessons in Electricity" (1876); and "Essays on the Floating Matter of the Air, in relation to Putrefaction and Infection" (1881). Some of these have been translated into various European languages. His work on

"Sound" has been published in Chinese at the expense of the Chinese government.

**TYNDAR'EUS.** See TUNDAREOS.

**TYNE**, a river in the north of England, in the county of Northumberland, is formed by the union, near Hexham, of two branches, called North and South Tyne. The North Tyne rises in the Cheviots, by several heads, of which the principal is near the base of Peel Fell, the point of union of the Pennine chain of England, the Cheviots, and the Eskdale range of the South Highlands. The South Tyne has its origin near the north base of Cross Fell, on the borders of Cumberland and Westmorland, close to the sources of the Tees. Both are considerable streams, but flow through wild moorland tracts, and are liable to violent floods. From Hexham, near which they unite, the course is nearly east to the North Sea. A few miles above Newcastle there is a fall, which stops the tide. A harbour of refuge has been formed at the mouth by the construction of long piers on each side; and the bed of the river up to Newcastle deepened and improved at a great expense. Length, 80 miles; area of basin, 1050 square miles. Rise of spring tides, 11 feet 7 inches at Newcastle; at the mouth, 18 feet.

**TYNEMOUTH** (pronounced *Tin'mouth*), a town of England, in the county of Northumberland, situated at the mouth of the Tyne, on its northern bank, 278 miles from London by rail. There are numerous churches and chapels for various religious bodies, a free library, a sailors' home, a fine park, an aquarium, a stone pier, and good bathing facilities. Shipbuilding is carried on, and there are manufactures of rope, sails, and other shipping requisites. The corporation consists of six aldermen and eighteen councillors, including the mayor. One member is returned to the House of Commons. The borough, including the port of North Shields, had a population of 41,118 in 1881.

This was formerly a Roman station, though there has been some dispute as to its exact identity. In the Saxon era, and subsequently, it was in great repute as the burial-place of Oswin, its patron saint, and other celebrities, both royal and ecclesiastical. It suffered so much from the Danes that at one time its Christianity was nearly extinguished. Within the walls of Tynemouth Castle are the ruins of the monastery, and at the east end of them is a beautiful chapel known as the Lady Chapel. Tynemouth was enfranchised by the first Reform Act.

**TYPE and TYPE-FOUNDING.** Type (Gr. *typos*, an impression or stamp), in **PRINTING**, is the name given to the letters, stamps, and signs of all kinds with which books, newspapers, and periodicals are printed. Their invention is generally ascribed to Koster, the original discoverer of the art of printing. He at first used blocks of wood, on which he engraved, or carved, the words required, but afterwards introduced separate wooden letters. Gutenberg, about 1466, first endeavoured to form types of metal. His method was to cast the shank or bodies of a suitable size, and then to engrave the letters upon them. Schæffer, in 1452, completed the invention of metallic types by casting them with faces. He cut matrices for the whole alphabet, and from the types produced issued the *Druck der Rationale*, which was finished in 1459.

As the art of printing spread over Europe, the early printers usually manufactured their own types, the various branches of the art—type-founding, printing, and binding—being closely and carried on under the general term of "printing." Type-founding did not become a distinct manufacture in Britain until the seventeenth century. In July, 1657, a Star Chamber decree on printing stated, among other regulations, "That there shall be four founders of letters for printing, and no more;" and vested the power of supplying the places of these four with the Archbishop of Canterbury, the Bishop of London, and other six high

commissioners. These restrictions continued in force till 1690, when the art was erected into a free and independent trade. Until the advent of William Caslon; however, the British were unable to compete with the productions of the German founders, who exported largely to Britain; but the beauty and excellence of his workmanship rapidly superseded the foreign type, and his fonts were in turn exported to the Continent. The reputation thus given to British type-founding has since been zealously upheld, until the art has well-nigh attained perfection, both as regards beauty of execution and rapidity of production.

Down to the year 1465 the type used in printing was known as **Black Letter**, when the form of type now in general use, termed "**Roman**," was introduced in a volume executed at Rome. The Roman "face" consists simply of circles, arcs of circles, and straight lines; and to their graceful combination is due that elegance and regularity which characterizes the best modern efforts of typography. *Italic* type was first produced at Venice, in 1496, by Aldus Manutius.

As now manufactured, a type itself is a thin metallic bar, of varying width, having, in Britain, a uniform height of  $\frac{3}{16}$  inch—slightly differing from the continental standard.

The success of typography depends on the accuracy of the types. They must be made so that they can be combined and recombined and interchanged with the greatest facility. The page of a daily newspaper, which may contain 150,000 pieces of metal, must be truly square, as if made of one piece. The first step is the making of punches, which consists in cutting on the end of a short bar of soft steel a model for each character which will be used in the font or assortment of types. When the steel has been hardened the punch is struck on the side of a thin bar of rolled copper, producing a reversed duplicate of the model type, which when truly squared and fitted to a mould constitutes the matrix. All the matrices of a font are made to fit one mould. The type mould consists of two firmly screwed combinations of several pieces of steel, making right and left halves, each of which is almost the counterpart of the other. These halves are immovable in the direction which determines the height or depth of the body, but are readily adjustable in the direction which determines the width of the letters, so that they can produce either l or w with no further delay than that caused by the change of matrix. At one end of the mould the matrix is fitted; at the other end is an opening through which the melted metal is injected.

Various attempts were made during the early part of the present century to cast type by machinery, the original machine being first devised in America about 1828, since which it has undergone many modifications in the hands of different founders, both in Great Britain and America, and its use has become so general that the process of hand-casting has been almost entirely superseded. The ordinary improved casting machine consists, first, of a small melting pot containing the molten metal, which is placed over a small furnace having an outer case or frame of cast iron. In the interior of the pot is arranged a forcing-pump and valve for admitting the metal under the piston, and for preventing the return of the metal into the pot when the piston is depressed, thus securing the full force exerted upon the piston being transmitted from it to the molten metal below, and forcing it through a narrow channel to the outside of the pot. Here a nipple is inserted, with a small hole drilled through it to communicate with the narrow channel. The mouth of the type mould is brought up against this nipple at the moment that the piston descends and forces the metal upwards, and thus receives the due supply of metal requisite to form the type. The second part of the machine is that which carries the mould, and to which it is firmly secured. The mould itself is similar to



the old hand mould, though modified to suit the machine, and much stronger. It is also made in halves, the one half being bolted to an arm, which is made to oscillate (by means of cams and levers), and carry the mould to and from the nipple above the pot; the other half of the mould is bolted to another arm, so attached to the first arm that the two halves of the mould may be made to open and shut upon each other like the lid of a box, and thus both sides of the mould oscillate together to and from the nipple in the pot from which the metal is received.

The furnace, with the pot and machine carrying the mould, is raised upon cast-iron framing to a height convenient for a man to stand and watch the working of the machinery, which may be thus briefly described:—The piston being raised in the chamber of the pump, and the chamber being supplied with metal through the valve, the mould is brought against the nipple; the valve closes, to prevent the metal being forced back into the pot; the piston descends and forces the metal through the narrow channel into the mould; the mould then recedes from the nipple, and in receding the two halves separate from each other and eject the type; the mould again approaches the nipple, and in approaching the two halves close together, and are ready for another operation. A blast of cold air is directed upon each mould to keep it cool; and in order to prevent the metal from adhering to the nipple, this part of the apparatus is kept lubricated with liquid tallow, which is made to drop on it through a small siphon. This machine will produce an average of 40,000 types per day.

The composition of type-metal varies greatly. Its chief components are lead, regulus of antimony, and tin. The antimony gives hardness and sharpness of edge to the compound, while the tin communicates toughness and tenacity, and removes the brittleness which the antimony would otherwise produce. The actual proportions of the metals are regulated by the size of the type, a greater quantity of antimony being employed for small than for large types.

The principal regular bodies to which types for book-work are cast in Britain are Nos. 1 to 14 of the following list, the others being seldom used:—

- |                  |                          |
|------------------|--------------------------|
| 1. Brilliant.    | 12. Pica.                |
| 2. Diamond.      | 13. English.             |
| 3. Pearl.        | 14. Great Primer.        |
| 4. Ruby.         | 15. Paragon.             |
| 5. Nonpareil.    | 16. Double Small Pica.   |
| 6. Emerald.      | 17. Double Pica.         |
| 7. Minion.       | 18. Double English.      |
| 8. Brevier.      | 19. Double Great Primer. |
| 9. Bourgeois.    | 20. Double Paragon.      |
| 10. Long Primer. | 21. Canon.               |
| 11. Small Pica.  |                          |

Canon is the largest British size with a specific name: above it Pica becomes the standard of measurement, all large types being proportioned to a given number of picas in depth, such as 4-line pica, 8-line pica, &c., up to the largest sizes used in posting-bills, which are usually carved on wood. Pica is also the general standard in preparing the diversified materials used in connection with printing, such as leads, brass rule, furniture, &c., which always bear a certain proportion to each other.

The above sizes, both as applied to regular, and especially to ornamental faces, have undergone every change in form which taste or fancy could suggest, every variety bearing a distinctive name to assist its recognition. In addition to the regular bodies there are sizes known technically as "bastard" fonts, that is, with the face of one font cast upon the body of another, such as a *Brevier* face cast upon a *Bourgeois* body, or a *Pica* body cast with a *Small Pica* face.

Subjoined we offer a specimen of book-types from Great Primer to Brilliant, showing the proportion which one size

of type bears to another in *width*. It must be observed, however, that almost all foundries have peculiar standards of their own, so that fonts from different makers do not always bear the same proportion in *depth*. The limitation of each line is marked by an inverted full point:—

There are fundamental  
 There are fundamental· tru  
 There are fundamental· truths tha  
 'There are fundamental· truths that lie a  
 'There are fundamental· truths that lie at t  
 'There are fundamental· truths that lie at the  
 'There are fundamental· truths that lie at the bot  
 'There are fundamental· truths that lie at the bottom  
 'There are fundamental· truths that lie at the bottom,  
 'There are fundamental· truths that lie at the bottom, the b  
 'There are fundamental· truths that lie at the bottom, the bas  
 'There are fundamental· truths that lie at the bottom, the basis upon w  
 'There are fundamental· truths that lie at the bottom, the basis upon which a great ma  
 'There are fundamental· truths that lie at the bottom, the basis upon which a great many others

A complete assortment of any book-type is termed a "font," which consists in the English language of about 200 different characters, including capitals, small capitals, small or "lower-case" letters, figures, points, spaces, quadrats, accents, italic letters, &c.

**TYPE WRITER**, an American invention for superseding the use of the pen. It is a machine in size and outward appearance resembling an ordinary domestic sewing-machine more than anything else. It does not write in the common sense of the word, but may rather be said to print, inasmuch as it transfers the form of letters and figures from type to paper through the medium of ink and by pressure, although the characters are impressed singly and successively letter by letter and line after line as in the process of writing. As now made type writers will print several styles of type, including capitals, small letters, stops, numbers, &c. The writing of the machine is almost as legible as print, and nearly as uniform; the average speed from fifty to seventy words a minute. Any number of copies from one to sixteen can be made on the type writer at once by the manifold process. The instrument is worked by means of keys communicating each with a lever terminating in a sort of transverse bar or crutch head, which carries a type on each extremity. By means of two keys at opposite ends of the board the paper carrier is moved backwards or forwards, so that in one position it receives a blow from one end of the transverse bar, and in the other position from the second end. The ink is carried on a ribbon, retaining its moisture and power of marking for several months, consequently the supply is practically continuous and inexhaustible. The size of these instruments is 10 inches by 16 inches.

**TYPHACEÆ** is an order of plants belonging to the group Monocotyledons, series Nudifloræ. [See BOTANY.] The species are reed-like herbs growing in marshes, ditches, or shallow water. They have a creeping perennial root-stock, solid cylindrical stems, and long, narrow, entire alternate sheathing leaves. The flowers are seated on a monocious spadix, either in dense spikes or globular heads, the male flowers occupying the upper, the female the lower portion of the spadix, which is sometimes furnished with leafy spathe, which soon fall off. The flowers have no perianth, unless the bristles or membranous scales intermixed with the stamens and ovaries be regarded as such.

The stamens in the male flowers are numerous. The ovary is sessile or on long stalks when ripe, with a simple style and one or two cells, containing a single ovule. The fruit is dry or spongy. Only two genera are contained in this family, *Typha* and *Sparganium*. The species are generally diffused over the world. The starchy rhizome of the species of *Typha* possesses slightly astringent and diuretic properties, and is used in parts of Asia as a remedy in dysentery. The stems and leaves of *Typha* are also used for thatching cottages, and the pollen is made into bread by the natives in Sind, and also in New Zealand. Two species of *Typha* are found in Great Britain, where they are known as *REED-MADE* or *Cat's-tail*. Several species of *SPARGANIUM* are British, where they have received the name of *Bur-weeds*.

**TYPHOID FEVER.** See FEVER.

**TYPHOON** (Chinese, *ti-fun*, hot wind), a name frequently applied to a tropical storm, especially the storms of the China seas and deserts; it is also given to the hot winds which occasionally blow with great violence in Africa, Syria, Arabia, and Persia; and which are felt, though rarely and with much-diminished force, in the southern parts of Italy and Spain. The sirocco of Egypt and the *east* of the Mediterranean, the *simoom* of Arabia, the *harmattan* of the coast of Guinea, and the hurricane of the West India Islands, are understood to be so many designations of the same thing. The fatal effects which have been said to result, both from the masses of moving sand and from the supposed deleterious quality of the winds of the Chinese and Arabian deserts, are now considered as exaggerations; the inconveniences felt by men and animals during the continuance of the typhoon and *simoom* are chiefly such as arise from the heat and dryness of the air, and from the quantity of sand which is blown into the eyes. Typhoons now come under the general class of circular storms called *cyclones*.

**TYPHON or TYPHGEUS.** See TYPHAON.

**TYPHUS FEVER.** See FEVER.

**TYR or TIUS** (among the oldest English called *Tie*), a Norse god, still more ancient than Wotan and Thor; the god whose "day" is *Tues-day* (Tuesday). See ZIO.

**TYRANNY.** See TYRANT.

**TYRANT.** The words *tyrant* and *tyranny* come from the Greek *tyrannos*, through the Latin. Tyrant (or rather *tyrannos*) is used by Herodotus and Thucydides, to signify a person who possessed sovereign power and owed it to usurpation, or who derived it from a person who had obtained such power by usurpation, and who maintained it by force. A familiar example of a tyrant is Peisistratos, who usurped the supreme power at Athens, B.C. 560, and was succeeded in it by his eldest son Hippias. A Greek tyrant who obtained sovereign power was a monarch in the proper sense of that term. If he acquired a power which was somewhat less than sovereign, he was not monarch; but in either case he would perhaps be called *tyrannos*; and accordingly the word does not express with accuracy the degree of political power, but it rather expresses the mode of acquisition, or refers to its originally illegal origin. The word, as used by the older Greek writers, did not carry with it any notion of blame; it simply denoted a person possessed of such political power as above mentioned, whether he used it well or ill. Many so-called tyrants were popular, and were men of letters and patrons of literature and art.

The Roman writers often use *tyrannus* as simply equivalent to king, especially the poets. Cicero couples *dominus* and *tyrannus*, thereby intending to use *tyrannus* in a bad sense, which was perhaps the more common acceptance of the word among the Romans in his time. Trebellius Pollio has written the "History of the Thirty Tyrants" who sprang up in the Roman Empire in the time of Galienus and Valerian. These so-called tyrants were not

more tyrannical, in the modern sense of the term, than many of the Roman emperors.

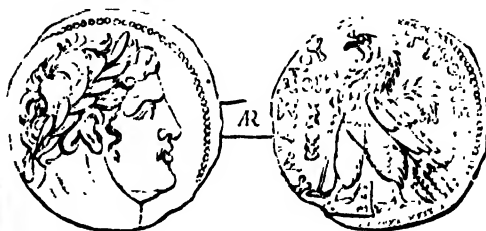
The use of the modern words *tyrant*, *tyranny*, *tyrannical*, has been as vague as that of most other political terms. The term "tyrant" is properly limited to the despotism of one man, and the popular application of the term expresses disapprobation of his conduct.

**TYRANT-BIRD.** See KING-BIRD.

**TYRCON'NELL, RICHARD**, Earl of, lord-deputy of Ireland in the reign of James II., belonged to an old Norman family long settled in Leinster, which remained Roman Catholic, and took that side in the Irish Rebellion of 1641. A handsome, dissolute, and unprincipled man, when the sons of Charles I. were exiles he was introduced to Charles and James in Flanders as a person ready to undertake the assassination of Cromwell. After the Restoration he figured at court and ministered to James's amours. On the accession of his patron, he was created Earl of Tyrconnell, and commanded the forces in Ireland when the second Earl of Clarendon became viceroy. Tyrconnell was forward in advising James to an unconstitutional and arbitrary policy, and made preparations to support it by disarming the Protestant population of Ireland and remodelling the army there. In February, 1687, he was appointed by James lord-deputy, with the powers of lord-lieutenant. After the flight of James II. from London, he advised him to come with French troops to Ireland, to the Celtic and Catholic population of which he appealed with success. Brave, but without military skill or knowledge, he proved incompetent at the battle of the Boyne; and in the later stages of the Irish war obstructed Saint Ruth and Sarsfield. He died of apoplexy in August, 1691, at Limerick, which he was preparing to defend, and, says Lord Macaulay, in whose "History of England" there is a graphic account of Tyrconnell, "the wasted remains of that form which had once been a model for statues were laid under the pavement of the cathedral, but no inscription, no tradition, preserves the memory of the spot."

**TYRE**, a celebrated city of Phœnicia, the remains of which are situated about 47 miles south-west of the modern Beirut. This ancient daughter of Sidon soon surpassed the parent in prosperity, and became the greatest commercial mart of the ancient world.

The position of Tyre was originally confined to the mainland, but gradually its buildings were extended to a rocky isle, separated from it by a narrow arm of the sea. Eventually, for the sake of security, the inhabitants became wholly insular, and strongly fortified their home. It fell into the hands of Alexander the Great after a long siege, 332 B.C., owing to his construction of an enormous causeway or pier from the main shore to the island, over which his troops marched with their engines to the assault of the walls. Though sacked, the city revived, and was populous



Coin of Tyre.

at the commencement of the Christian era. It was taken by the Saracens in the seventh century; recovered by the Crusaders in the twelfth, and made an archiepiscopal see, of which William of Tyre, an Englishman, the well-known chronicler, was the first prelate. Mastered finally by the

Turks, it sank rapidly into complete insignificance, and became by the seventeenth century a miserable village, inhabited by a few fishermen. Sur, its present Arab name, now occupies a peninsula, accumulations of sand having converted the causeway of Alexander into an isthmus more

than a quarter of a mile in width. The ruins of an old church—some tottering walls of ancient date, and towers that mark the time of the Crusades—a white-domed mosque, a few unconnected houses, jumbled together on the sea-washed rock—and rising above all, some waving



Tyre.

valms, whose plummy tops seem to mourn over the surrounding desolation, are all the objects that now present themselves to the traveller on a spot once "glorious in the midst of the seas," whose "merchants were princes, and whose traffickers were the honourable of the earth."

**TYROL**, a province of Austria, bounded N. by Bavaria, E. by Carinthia, S.E., S., and S.W. by Italy, and W. by Switzerland. The total area is 11,324 square miles, and the population 912,549 in 1886. Tyrol is surrounded on nearly every side by elevated mountains, and with the exception of a comparatively small tract, the interior of the country is also covered with high mountain masses, in which a great number of summits rise above the snow-line and are surrounded by extensive glaciers. Level tracts, admitting of cultivation with the plough, are only found on the banks of the rivers, where they sometimes attain a width of a mile, and in a few places more; but they are usually not more than half a mile wide. These tracts do not cover one-tenth of the surface; two-tenths are meadows and commons, and the remainder are occupied by the higher and lower mountain masses of the Alps.

*Physical Aspect.*—Tyrol may be considered a continuation of Switzerland, and with regard to scenery is only second to that country. The Alps stretch across it from west to east in three nearly parallel chains. The loftiest is the Rhaetian Alps, which occupy the centre, and divide the province into a north and south portion. In this chain are situated the Ortler Spitz; the culminating point of the Austrian Empire, 12,852 feet; and the Gross-Glockner, 12,560 feet. The second parallel chain, situated in the north, not far from the frontier, forms the Tyrolean or German Alps; and the third chain, to which the name of the Trent Alps is sometimes given, bends round from the Lake of Garda, and continues east till it becomes linked with the Carnic Alps. All these chains descend very abruptly on the south side, and form short lateral valleys,

but on their north sides generally slope gradually by parallel terraces, the spaces between which are occupied by long longitudinal valleys. Many of the summits are capped with perpetual snow; and glaciers to the number of eighty, covering in all a space of about 170 square miles, descend into the valleys to the level of about 4000 feet. The most remarkable of these glaciers are the Oesthal, Saldon, Floiten, and Dux. Notwithstanding the height of the chains, Tyrol has several of the lowest passes in the Alps. The celebrated Brenner Pass is little more than 4000 feet above sea level, and over it runs the principal route for the conveyance of merchandise between Italy and Germany. The other principal passes are the Malserheide, Timbljoch, Arlberg, Schlossberg, Achen Pass, and the pass near San Pellegrino. The loftiest of all the passes is the Stilfser or Wormserjoch, which is 9000 feet above the sea. Two railway tunnels have been pierced, the first in 1867, below the Brenner Pass, the second in 1883, through the Arlberg,  $6\frac{1}{2}$  miles in length.

*Hydrography.*—The drainage is divided between the basins of the Rhine, Danube, and Po. The first, forming part of the north-west boundary, is confined to that locality, and receives only the waters of the Vorarlberg, in part directly, and in part by the Ill and the Bregenz; the latter through the medium of the Lake of Constance. A much larger share of drainage is received by the Danube, whose important tributary the Inn, traversing the celebrated valley of that name, inclosed on the south by the Rhaetian and on the north by the Tyrolean Alps, receives from both chains, but especially from the former, numerous torrents and streams fed by perpetual snow and glaciers. Another large supply to the Danube proceeds from the south side of the Rhaetian Alps, where the waters of the east part of the Pusterthal, and of a number of lateral valleys, go to augment the Drave. The Adriatic receives its share chiefly through the Etsch or Adige. Not one of these rivers, ex-

cept the Inn, is of navigable importance; but their effect on the scenery may be estimated from the fact that they form above 150 large waterfalls.

The largest lakes, the Idrio, Garda, and Constance, being situated on the frontiers, belong less to Tyrol than to other countries. The others, though very numerous and picturesque, are small.

*Climate.*—As a great portion of the country, probably one-tenth, is always covered with snow, while its more southern valleys are hardly 500 feet above the sea-level, the climate varies greatly in different places. At Innsbruck the mean temperature of the winter is  $30.5^{\circ}$ , or nearly  $8^{\circ}$  less than at London; and that of the summer is  $64^{\circ}$ , or about  $2\frac{1}{2}^{\circ}$  more than at London. The mean annual temperature is  $49^{\circ}$ , or one degree less than at London. At Trent the mean annual temperature is  $53^{\circ}$ , or nearly  $3^{\circ}$  higher than at London, and the climate of the southern valley, generally, is similar to that of Northern Italy. In some elevated parts in the north, however, it is very severe. Owing to the great unevenness of the surface, the air is in continual motion, and a calm day is a rare occurrence. The southern winds are like the sirocco of Italy. They are most frequent towards the end of summer and dissolve in a few hours an immense quantity of snow, which about that season begins to cover the less elevated mountains, and the volume of water thus conveyed to the rivers produces extensive inundations in some parts of the valleys.

*Natural Products.*—The richest lands are in the valleys of the Inn and Adige. Wheat, rye, barley, and oats are cultivated. In some parts buckwheat is grown. Millet is also grown, but not extensively. Indian corn is the principal object of agriculture in the southern valleys, and potatoes are cultivated both in the north and the south. Hops grow wild, and tobacco is cultivated to some extent in the southern valleys. Flax and hemp are grown. Fruit trees abound, and large quantities of fruits are exported to Bavaria. Near Trent are plantations of fig trees, and at Roveredo chestnuts are very common. In these parts there are also plantations of the olive and mulberry. A considerable quantity of silk is annually collected. The banks of the Lago di Garda are enriched with orange groves. The sides of many of the mountains are covered with forests of beech and fir, according to the elevation. The flocks and herds are driven up to the height of from 5000 to 6000 feet to pasture during the summer months, as in Switzerland. In the north of the country immense numbers of canaries are reared; in fact, the Tyrolese supply nearly all the rest of Europe with those birds. Among the wild animals are chamois, hares, marmots, and partridges, and some large birds of prey, especially eagles. Gold, silver, and copper are found: lead, iron, calamine, and coal-mines are worked. There are productive mines of rock-salt near Hall, below Innsbruck. In the southern districts there is also a valuable kind of white marble, which is much worked.

*Population.*—Though the inhabitants are industrious, Tyrol is not a manufacturing country. The women spin flax, weave linen, knit caps and stockings, make baskets and straw-hats for home use, and there are glass and paper factories at Innsbruck. Carpets and gloves are also manufactured, and wooden wares are made very extensively during the winter by the peasantry. The exports are chiefly cattle, cheese, timber, wine, tobacco, silk, iron, and salt, and the imports grain and manufactured goods. The transit trade of Tyrol is considerable, and much facilitated by the admirable roads. Many of the inhabitants annually migrate as pedlars or hawkers, owing to the impossibility of obtaining a subsistence in a region where the pasturage is so limited and the sterile ground so extensive. The Tyrolese have a remarkable talent for the fine arts, and education is widely extended. There is a university at Innsbruck. The beneficent and charitable institutions are

numerous and well conducted. The inhabitants are all Roman Catholics. They are all fond of athletic exercises, are admirable as marksmen, and expert chamois hunters. Music and dancing are favourite amusements. In the southern districts of Tyrol the people resemble the Italians in language, manners, and dress; in the north, where they are three times more numerous, they adhere to old German habits and speak the German language. The country has its own provincial diet, which assembles at Innsbruck, and in which the nobility, clergy, and deputies of the towns and rural districts all meet in one chamber. The chief towns are INNSBRUCK and BOTZEN.

*History.*—Tyrol anciently formed the eastern part of the province of Rhetia, and was conquered by the Romans, 15 B.C. When the power of the Western Empire decayed, it became the favourite quarry of the warlike German tribes, until, after long years of turbulence and disorder, the northern valleys were permanently occupied by the Bavarian, and the southern valleys by the Lombard races. The Bavarian valleys were subdivided into *gaus*, each of which owned its own feudal chieftain, while acknowledging the general supremacy of the dukes of Bavaria. In the course of time one of these feudal lords rose to the position of paramount ruler, under the title of the Count of Tyrol, and his descendants retained the principality until it passed by the marriage of Margaret, the heiress of the last count, in 1359, to an Austrian archduke. The Lombard valley, meanwhile, had fallen to the see of Trent.

The province became an appanage of the younger or Tyrol branch of the imperial house of Germany, which came to the throne in 1618, in the person of Maximilian II. In 1805 German Tyrol was conquered by a French army under Marshal Ney, who forced the passage of Scharnitz, the ancient *Porta Claudia*, and captured Innsbruck. The treaty of Vienna ceded Tyrol to France, and Napoleon united it to Bavaria, in recognition of the services rendered by his Bavarian allies, but greatly to the discontent of the Tyrolese, who were then, and ever have been, attached to the Austrian crown. This discontent gradually increased, until it broke out into an open insurrection in 1809, under the leadership of Andreas Hofer, an innkeeper, but a man of undaunted bravery and singular military ability. He was assisted by two men of scarcely inferior capacity, Spechbacher, a substantial yeoman, and Martin Tanier, a captain in the militia. It was on the 8th of April, 1809, that the signal was given, and the inhabitants everywhere responded to it.

Hofer first encountered the Bavarians on the plain of the Sterzinger Moor, and inflicted upon them a severe defeat, capturing 390 and killing 210. On the 11th, another body of the Tyrolese, under Steiner, drove the enemy out of Innsbruck, and hoisted the Austrian flag upon its walls. On the following day they defeated the French, under General Bisson, and compelled them to capitulate. The fortress of Hall, on the Inn, was next stormed by Spechbacher; and in the short space of one week the province was entirely delivered from the enemy, and all its fortresses, except Kufstein, recovered. The effect of these victories, says Alison, was to liberate the Southern as well as Northern Tyrol; for the French troops were so much discouraged by their reverses that they evacuated both Trent and Roveredo, and fell back to the neighbourhood of Verona. And had the Tyrolese been effectively supported by the Austrian government, a blow might have been dealt to the power and prestige of Napoleon calculated to have accelerated his overthrow. But the Archduke John, by a series of blunders, allowed Napoleon to pour into Tyrol a strong French force of 15,000 men, under General Baraguay d'Hilliers, while another army, under Lefebvre, ascended the valley of the Inn, marking its progress by the most terrible atrocities. Lefebvre recaptured Innsbruck, but Hofer immediately marched to its relief. In its neighbour-

hood a desperate struggle ensued. The Tyrolese were superior in numbers, but wholly undisciplined, without cavalry and artillery, and almost without ammunition. Their furious valour, however, proved irresistible, and the result of the battle was to place Innsbruck once more in their hands, and again to free Tyrol from the presence of its enemies.

But the Archduke John, while these glorious events were taking place, was rapidly retiring into Hungary, and the French, under Baraguay d'Hilliers, continued their advance. The Tyrolese, however, rejoicing in their successive victories, deemed themselves secure from further disasters. But meanwhile the Austrians were defeated on the fatal field of Wagram, their capital was again occupied by the French emperor, and a second treaty of Vienna for a second time abandoned to his vengeance unhappy Tyrol. The Austrian garrisons were withdrawn, and the peasantry left unaided to struggle against the overwhelming forces of the French. Hofer refused to submit when called upon by Davoust to appear at Innsbruck on the 11th of August, and returned for his only answer, "He would come, but it would be at the head of 10,000 skilful marksmen." On the 4th of August Haspinger attacked the advanced guard of the French and Bavarians in the ravine of the Etsch, caught them in a murderous ambush, and completely defeated them. Descending the valley of Passcyr he joined his forces with those of Spechbacher, and at Steinach threw himself upon the French army, under Lefebvre, with such fury that the French fell into a disgraceful rout, and fled pell-mell into Innsbruck, abandoning twenty-five pieces of cannon and their whole ammunition.

Similar successes attended the arms of the Tyrolese in other quarters, and emboldened and defiant they gathered in great numbers on Mount Isel, under the standard of their heroic leader. Lefebvre, burning to avenge his disgrace, collected all the troops he could gather on the bank of the Inn, between Innsbruck and the mountains, and with a well-equipped army of 23,000 foot, 2000 horse, and forty guns, awaited the attack of the peasantry. For long the contest was undecided, the superior discipline and admirable artillery of the French prevailing at first over the impetuous but disorderly assaults and deadly aim of the mountaineers. But towards nightfall the French and Bavarians began to give way, and were pursued with great slaughter into the town. They lost 6000 men, while on the side of the conquerors no more than 900 had fallen.

This was the last burst of sunshine that gilded the arms of the Tyrolese. In their simplicity they thought their victory had decided the contest, and for the most part returned to their own homes. Meanwhile Napoleon, now thoroughly roused, prepared such immense forces for a renewed attack on the country as rendered its subjugation a matter of certainty. Pouring into Tyrol they overran it in every direction, and though the peasantry continued to resist for three months longer, yet the desertion of Austria deprived them of much of their enthusiasm. The invaders swept the valley of the Inn with fire and sword, and no course was left for the gallant Hofer but submission. He was betrayed into the hands of the French by one Donay, who had been his intimate friend; was removed to Mantua, and contrary to all the principles of justice, tried by court-martial, and condemned to imprisonment. Napoleon, however, telegraphed peremptory orders that he should be put to death within twenty-four hours, that Austria might have no time to intrigue on his behalf. He met his cruel death (20th February, 1810) with an intrepidity worthy of his heroic career. His family, in 1819, were ennobled by the Austrian government, who also caused a statue to be erected to his memory at Innsbruck in 1831.

The treaty of Paris restored Tyrol to Austria. Of late years the inhabitants of Southern or Trentino Tyrol have manifested Italian proclivities; and it was sup-

posed that one of the results of the war between Prussia and Italy against Austria in 1866, would have been to hand over to Italy a province with which nature seems to have designed its union. No change, however, took place in the ancient boundaries. In the Italian War of 1859 Northern Tyrol was conspicuously loyal to the Austrian crown, and from its valleys were recruited the most skilful and daring sharpshooters in the Austrian army.

**TYROLIENNE**, a piece of music in the style of the Tyrolese folk-songs, with jodel variations, and often with dances interspersed between the stanzas of a chorus. A very well-known Tyrolienne of the latter type occurs in the third act of Rossini's "Guillaume Tell."

**TYRONE**, an inland county, in the province of Ulster in Ireland, is bounded N. and N.E. by Londonderry, E. by Lough Neagh, S.E. by Armagh, S. by Monaghan, S.W. by Fermanagh, and W. and N.W. by Donegal. Its greatest length E. to W. is 60 miles; its greatest breadth N. to S. is 46 miles. The area is 1250 square miles. The population in 1851 was 255,819; in 1861 it had decreased to 238,500, and in 1881 to 197,719.

*Surface, Geology, and Rivers.*—This county lies, for the most part, between the two mountainous districts which cross Ulster from east to west. The northernmost of these districts (that of Antrim, Londonderry, and Donegal) encroaches upon the northern border; and the southernmost (that of Down, Armagh, Monaghan, and Fermanagh) on the southern. Outlying groups of mountains occupy portions of the intermediate district, especially on the west, where they extend nearly across the county. Another group, connecting the two great mountain districts, crosses the county a little to the eastward of the centre, and divides the lower ground into two parts—the plain or basin of Omagh in the centre, and that of Lough Neagh on the east. The highest mountains are Slieve Sawel, 2236 feet, and Mullagh Clogher, 2083 feet.

The plain of Lough Neagh rises gradually from the shore of the lough westward towards the mountains which separate it from the plain of Omagh. The part adjacent to the lough is occupied by tertiary formations, consisting of beds of white, brown, and greenish-blue clay, alternating with white and gray sand; they have been bored in some places to the depth of 294 feet without reaching the subjacent formations. To the north-west of the tertiary beds, the secondary formations, chalk, greensand, and lias, crop out, being covered in places by masses of tabular trap. These are succeeded by the red marl or new red sandstone, which on the south-west immediately succeeds the tertiary beds. Between Dungannon and Stewartstown lies a small coal-field, which contain more beds of workable coal than any other in Ireland. Some of the coal is used for domestic fires, but it is mostly only fit for lime and brick kilns. The formations of the limestone group occupy nearly all the remainder of the plain, and extend south-west to the neighbourhood of Clogher, where it rises into tolerably high mountains.

The plain of Lough Neagh is drained by the Ballinderry in the north, and the Blackwater in the south; both have the upper part of their course in the county, and the lower part on the border. The length of the Ballinderry is about 25 miles; of the Blackwater, 46 miles.

The plain of Omagh is inclosed on nearly every side by mountains; it is drained by the streams which unite to constitute the Foyle.

The Camoan, or Camowen, the principal of the streams which unite to form the Foyle, rises in the mountains that separate the plains of Lough Neagh and Omagh, and flowing westward to Omagh receives the Drumragh from the southern part of the county; it then turns northward and flows by Newton-Stewart to the border of Donegal at Strabane; and after separating Tyrone from the latter

for some miles, finally quits the county to enter that of Londonderry. Its whole length, including Lough Foyle, is about 76 miles, of which above 50 are in this county or on its confines. It takes the name of Strule soon after its junction with the Drumragh; below the junction of the Derg it is called the Mourne, and finally, after joining the Finn, the Foyle.

The lakes are numerous; but are all small except Lough Neagh, of whose surface more than 27,355 acres, or nearly 13 square miles, are assigned in the Ordnance Survey to this county.

**Soil and Agriculture.**—Nearly one-fourth of the surface of Tyrone is unimproved mountain and bog. Of the remainder the plain of Omagh occupies more than one-third, and is the most fertile part. The climate is moist, and the low lands are often flooded. Tillage is practised on improved principles in the fertile parts, and young cattle are reared in the hilly and mountain districts. Peat bogs and mosses abound in many parts, and in their vicinity the land is of a peaty nature upon a clayey subsoil. The peat turf supplies the chief part of the fuel which is used by the population.

**Manufactures.**—The manufactures of this county are linens, coarse woollens, blankets, whisky, beer, flour, oatmeal, common earthenware, soap, candles, &c. Flour mills and scutching mills are numerous. Agriculture, however, is the principal occupation. The county is traversed by railways, which connect it with Dublin, Belfast, and the sea-coast at Dundalk.

**Division.**—Tyrone is divided into eight baronies, and contains forty-six parishes. The assizes are held at Omagh. The county returns four members to Parliament, one for each division.

**History.**—This county seems to have been included in the territory of the Darul, a nation mentioned by Ptolemy. By the Irish, it appears to have been called *Tiroon*, modernized *Tyrone*. It was in the Northern Hy-Niall, the country of the O'Neills, which comprehended also a large part of Donegal. The O'Neills were kings of Ireland antecedent to Christianity, and were chiefs of Tyrone when the rebellion of 1597 broke out under their auspices.

Tyrone was formed into a county in 1581, but the first

sheriff was not appointed until after the close of 1603. It was comprehended in the great settlement made in Ulster in the following years, and was in great part parcelled out among "undertakers" (persons who undertook to form settlements or colonies), partly Scotch, and partly English.

**TYROSINE**, a nitrogenous substance obtained by Liebig from the decomposition of casein by fusion with caustic potash. It has since been prepared also from horn, feathers, hair, and other animal substances, by the action of caustic potash or of sulphuric acid. It also occurs with leucine in the spleen, liver, pancreas, and urine of animals, and in cochineal. It crystallizes in silky needles, which are soluble in boiling water, much less so in cold water, slightly soluble in alcohol, and insoluble in ether. The formula is  $C_9H_{11}NO_3$ . When warmed with a little strong sulphuric acid, diluted with water, and neutralized with barium carbonate, the liquid is coloured violet by the addition of ferric chloride. The reaction forms a delicate test for tyrosine. It has the properties of a weak acid, but it is soluble in acids and in alkalis, forming definite compounds with both. The compound with sodium has the formula  $C_9H_9Na_2NO_3$ . The hydrochlorate of tyrosine ( $C_9H_{11}NO_3HCl$ ) crystallizes in needles, which are soluble in alcohol, but water resolves it into tyrosine and hydrochloric acid.

A mido-tyrosine ( $C_9H_{12}N_2O_3$ ), obtained by reducing nitro-tyrosine, is a crystalline powder soluble in water. It forms crystalline salts with acids, of which the hydrochlorate has the formula  $C_9H_{12}N_2O_3 \cdot 2HCl$ .

Nitro-tyrosine,  $C_9H_9(NO_2)NO_3$ , obtained by the action of nitric acid on tyrosine, crystallizes in yellow needles. Like tyrosine it unites both with acids and bases. Dinitro-tyrosine,  $C_9H_7(NO_2)_2NO_3$ , unites with bases; it crystallizes in yellow scales insoluble in water, and forms red salts, which detonate when heated. Dibromo-tyrosine ( $C_9H_7Br_2NO_3 \cdot 2H_2O$ ) crystallizes in white needles soluble in hot water; it unites both with acids and bases. Tyrosine forms several conjugate acids with sulphuric acid.


**TYRTÆUS.** See **TURTAIOS**.

**TYTHING.** See **TITHING**.

**TZAR.** See **TSAR**.

**TZE-TZE.** See **TSE-TSE**.

## U

**U** is at one extremity of the series of vowel sounds, lying next to the vowel *e*; the true order of vowels being *u, o, a, e, i*. The mouth, when placed for *u*, forms a resonance chamber with the proper tone *f*.  [See **VOWEL-TONES**.] In the Hebrew alphabet it does not appear, and was probably originally wanting in that of the Greek tongue. In the older English, as in the Latin, *u* and *e* are represented by one character.

1. The close connection between this vowel and the vowel *o* might be inferred from their relative position in the vocal gamut.

2. *U* long is interchangeable with the diphthongs *oe* or *ou* in Latin. Thus *cura, ulor, unus, unius, murus*, often appear in the older dialects of that language as *coira* or *ouira, ulor* or *oulor, ceirus, unius* or *uenius, moerus*. In the same way *foetus* and *foeculus* are formed from *foetus* and *foeculus* by the addition of the common suffixes *tus* and *ulus*, which are so often attached to verbs. The variations in the names of *poeni* and *punius* is an example of the same principle. But in modern languages long *u* remains unaltered, as French *mur* (*murus*), *aigu* (*acutus*), &c. On the other hand, *u*, becoming long only by position, is in French *ou*, as *ours* (*urus*), *tour* (*turris*), &c.

3. *U* interchanges with *au*, as in the Latin forms *claudu* and *cludo*, and the Latin *mus* compared with the German *maus*, a mouse.

4. Short *u* in classical speech becomes *ou* in French, as *loup* (*lupus*), *couver* (*cubo*), &c.

5. Short *u* interchanges with short *e*. Thus the Greek tongue prefers the syllable *eu* where the Latin writes *ul*, particularly in the penult syllable; as *Scylos*, *Scyllus*. The Germans again prefer *el*. Hence the Latin *tabula, fabula* appear in German as *tafel, fabel*. The vowel *u* is also preferred by the Romans before *n*, if a *d* or *t* follow. Hence *reduns* is a genuine *reduntis*, and *faciendus* is as common as *faciundus*.

6. For the interchange of short *u* with *i*, see **I**.

7. For the interchange of *du* with *b* and *c*, see **B**, **D**.

8. For the interchange of *l* with *u*, see **L**.

9. *Ou* not infrequently results from *ou*, particularly in the Greek language, as *odous* for *odous*, *tuptionsi* for *tuptontis*; and the accusative plural of the second declension, *aikous*, is a corruption of *aikons*, being formed from the singular *aikon* by the addition of the affix for plurality. So in French *epoux* (*spanaus*), *couvent* (*conventis*).

10. For the loss of an initial *e* before *u*, see **C**.



11. The insertion by the English of a *y* sound before *u* is not limited to an initial *u*, as in *union, university*, but occurs in the middle of words. Thus, in Norfolk *true* is sometimes pronounced *tryoo*. It is probably in this way that the English have adopted the orthography *ew* in so many words, as *new, few*.

12. For the intimate connection of *u* with *V* and *W*, see those letters.

**UBEDA**, a city in the province of Jaen, in Spain, situated at the foot of a mountain, in 37° 56' N. lat., 3° 21' W. lon., about 25 miles N.E. from the city of Jaen, has 15,000 inhabitants, mostly employed in agricultural pursuits. The town is well built, with several wide streets and some handsome squares. The public buildings remarkable for their architecture are—the cathedral, formerly a mosque; the Church of San Salvador, the Dominican convent in the Plaza del Llano, the hospital, the exchange, and the building called El Exido, at the commencement of the road to Baeza. Coarse woollens, blankets, hats, and porous vessels made of red and white clay, are the chief manufactures. The plain on which Ubeda stands is one of the most fertile parts of Andalusia, and yields abundant crops of grain and oil, which are carried into the interior. Ubeda has an annual fair on the 29th of September, in commemoration of the taking of the city from the Moors in 1239. Under them it is said to have contained 70,000 inhabitants.

**UCCELLO, PAOLO**, the name by which Paolo di Dono is commonly known, from his love of painting birds (Ital. *uccelli*). He was born in Florence in 1397, was brought up, like so large a number of the Florentine painters, as a goldsmith, and was one of the assistants of Lorenzo Ghiberti in the making of the first pair of bronze gates executed by him for the baptistery of Florence. Few of his paintings now remain, but a masterpiece by him, the "Battle of St. Egidio, 1416," remarkable for its armour and the spirit of its horses, is now in the National Gallery. Paolo read geometry with Manetti, and was one of the first to apply perspective in detail. He had a passion for that science; it kept him up at nights and absorbed time that might have been more lucratively employed. His masterpiece in this kind, "The Drunkenness of Noah" fresco, is at Santa Maria Novella, Florence. He died at Florence in 1465.

**UDAIPUR' or OODEYPORE**, a city of India, and capital of the native state of Mewar or Udaipur in Rajputana. The site of Udaipur ("The City of the Sunrise"), with its palace placed on a low ridge overlooking a romantic lake, is one of the most beautiful and picturesque in India. To this place, after the capture of Chittor by Akbar in 1568, the Maharana Udai Singh of Mewar repaired, and built himself a refuge among the mountains; and shortly a city sprang up, which he called after his own name. In 1769 the city was besieged by the Marhattas under Madhuji Sindhia; and was only saved from capture by the vigour of the *dewan*, Umra Chand Barwa, and by the cession of some important tracts of territory.

The royal palace at Udaipur is a most imposing pile, of a regular form, built of granite and marble, rising at least 100 feet from the ground, and flanked with octagonal towers, crowned with cupolas. Although built at various periods, uniformity of design has been very well preserved; nor is there in the East a more striking or majestic structure. It stands upon the very crest of a ridge running parallel to, but considerably elevated above, the margin of the lake. The terrace, which is at the east and chief front of the palace, extends throughout its length, and is supported by a triple row of arches from the declivity of the ridge. The height of this arched wall is full 50 feet; and although all is hollow beneath, yet so admirably is it constructed, that an entire range of stables is built on the extreme verge of the terrace, on which the whole personal

force of the Rana, elephants, horse, and foot, are often assembled. From this terrace the city and the valley lie before the spectator, whose vision is bounded only by the hills shutting out the plains; while from the summit of the palace nothing obstructs its range over lake and mountain. The great lake, close to the city on the west, was constructed by Udai Singh; it is about 5 miles in circumference. There is also another smaller one, 6 miles west of it. Udaipur is situated at an elevation of 2064 feet above sea-level.

**UDAL TENURE**. The Norwegian term *udal* or *odel* appears to be the same as the German *adel*, or noble. Tenure is an improper name as applied to udal land, for the land so called in Norway is not held by any tenure, but is free from all services. There is neither superior nor vassal, nor any of the consequences of such feudal relation as exist in many countries in Europe.

*Udal right*, in the law of Scotland, means that right in land which may be completed without charter and sasine, by undisturbed possession, provable by witnesses before an inquest. Though dependent on the crown as superior, the vassal pays only a tribute called *skat*. The right is said to have been the old tenure prevalent in Britain before the feudal system was introduced, and prevails chiefly in Orkney and Shetland. The lands formerly held on udal right are now commonly converted into fens. Few readers will be ignorant of the magnificent portrait of Magnus Troll the Udaller in Scott's great novel "The Pirate."

**U'DALL, NICHOLAS**, the father of English comedy, was born in Hampshire in the year 1505 or 1506. He was educated at Corpus Christi College, Oxford, and took his degree of B.A. in 1524, but owing to his known attachment to the tenets of Luther he did not proceed to M.A. till 1534. His first work known to be extant was composed in 1532 for the Lord Mayor of London, in conjunction with his friend Ieland, the learned antiquary, being a pageant to celebrate the entrance of Anne Boleyn into the city after her marriage. He early acquired reputation as a teacher of the classical tongues, and in 1533 compiled and published selections from Terence, which he called "Floures for Latin Spekyng." In the following year he was appointed headmaster of Eton School. He was a severe master, using the rod unmercifully, and succeeded so ill in maintaining the discipline of the school that a robbery of the college plate by some of the scholars caused a public scandal in 1542, and led to the dismissal of U'dall. He had been accustomed to write Latin plays for the boys to act in the Christmas holidays, and was thus led, as it is supposed, to write "Ralph Roister Doister," the first English comedy. For a few years he was vicar of Braintree in Essex, but he still continued his literary labour. In 1545 he published a translation of Erasmus' "Apothegms," and of his "Paraphrase upon the New Testament." In this work he was associated with the Princess Mary, who contributed to the translation. From Edward VI. he received valuable church preferment in 1552 and 1553. Shortly afterwards he was appointed headmaster of Westminster School, an office which he held until November, 1556, when Queen Mary abolished the school to restore the monastery. A month afterwards, on the 23rd of December, 1556, U'dall died.

**UDINE**, the capital of Udine, a town of Italy, is situated in an elevated plain, near the foot of the Cune Alps, about 20 miles from the Adriatic, and on the railway from Venice to Vienna. The population in 1882 was 32,020. It is a walled town, between 4 and 5 miles in circumference, and has wide and handsome streets. Upon an eminence in the middle is the old castle, once the residence of the patriarchs of Aquileia, who were for several centuries lords of Friuli. Udine gives title to a bishop; it has some fine churches, especially the cathedral, distinguished for its marble pillars, carvings, and pictures; and the Church of San Pietro

**Martire**, several palaces, a handsome square lined with arcades and adorned with a fountain, a gymnasium, lyceum, clerical seminary, several public libraries, two museums, agricultural academy, philharmonic institute, monte-di-pieta, and theatre. The public palace, which was burned in 1876, was in imitation of the Doge's palace at Venice, and the buildings generally resemble those of the mother city so much that Udine is sometimes called Venice in miniature. A considerable trade in silk, the produce of the country, is carried on. There are silk, paper, and leather manufactories, a sugar refinery, and liqueur distillery. In the vicinity, and approached by an avenue of stately plane trees, is the Campo Santo, which, from the taste displayed in its arrangements, and the number and elegance of its monuments, ranks as one of the finest cemeteries in Europe. At the village of Campo Formio, about 2 miles from the town, was concluded the peace between Austria and France, in 1797, by which Venetia was ceded to the latter. There is a monument to commemorate this event in the market square of Udine.

**UDI'NE, GIOVANNI DA**, of the family of the Ricamatoli, was born at Udine in 1487. He studied some time with Giorgione at Venice, then joined Raffaele at Rome. Giovanni was employed chiefly on decorative work by Raffaele, and contributed largely to the execution of the paintings of the Vatican Loggie. At the period in which he lived he was unrivalled in the execution of animals, birds, &c. Giovanni copied for Raffaele the ancient fresco decorations of the baths of Titus at Rome, then recently discovered, and took part in the preparation of the celebrated cartoons for tapestry now at South Kensington. He died at Rome in 1564.

**UEB'ERWEG, FRIEDRICH**, a German philosophical writer, was born near Solingen, Rhenish Prussia, 22nd January, 1826. He studied philology at Göttingen under K. F. Hermann, and philosophy at Berlin under Beneke, and subsequently became a tutor at the University of Bonn, extraordinary in 1862 and ordinary in 1867. He was afterwards appointed professor of philosophy at Königsberg, where he died 7th June, 1871. His principal works are "System der Logik und Geschichte der logischen Lehren" (Bonn, 1857; 3rd edition, 1868; English translation by Thomas Lindsay, London, 1871), in which he agreed with Trendelenburg in the renewed founding of logic on Aristotelian principles; and "Grundriss der Geschichte der Philosophie von Thales bis auf die Gegenwart" (three vols., Berlin, 1862-66; English translation from the fourth German edition, by George S. Morris and Noah Porter, two vols., 1880).

**U'GAB** (Heb. *Aphph*), the ancient instrument translated "organ" in the Authorized Version, Genesis iv. 21 ("father of all such as handle the harp and the organ"), but "pipe" in the Revised Version of the same passage, was probably a sort of pandean pipe or syrinx.

**UGANDA**, a kingdom of Central Africa, forming a kind of crescent, extending westward along the northern shores of the Victoria Nyanza, from where the Nile flows out of the lake, and down the western side of the Victoria, about as far as the Kitangale, or "Alexandra;" its length is about 300 miles; breadth, 60. With various islands, the area of Uganda is about 30,000 square miles; but including the lands which recognize its sovereign's power and pay him tribute, the area would be about 70,000 square miles, with a population estimated at 2,775,000. The people appear to be of a singularly superior caste as compared with the ordinary African negro. In fact, it appears now certain that to behold the full perfection of African manhood and beauty, one must visit those regions, where the people may be seen under the cool shades of plantains, and amid the luxurious plenty which those lands produce. European travellers, after noting the great length and wondrous greenness of the banana fronds, the vastness of their stalks, and the bulk

and number of the fruit, the fatness of the soil and its inexhaustible fertility, the perpetual spring-like verdure of the vegetation, and the dazzling sunshine, come to notice also that frequently the inhabitants are in fit accord with these scenes, and as perfect of their kind as the bursting-ripe mellow bananas hanging above their heads. The country is well cultivated, and the highways are broad and good. Elephants are hunted for their ivory. King Mtesa, who received Stanley and invited missionaries to his country, died in 1887.

**UE'LAN**, a name of Tartar origin, signifying *brave*, was applied first to the light Tartar cavalry who, armed with lance and sabre, harassed the frontiers of Poland and Lithuania. It was afterwards transferred to the Polish cavalry raised and armed in a similar manner to repel the inroads of the Tartars, and was subsequently adopted by the Austrians and Prussians. In the Prussian army the Uhlans are carefully trained to act as scouts, and from their being the first to appear of the invaders their name became a sound of terror throughout France in the war of 1870-71. For preceding an advancing force, keeping touch with an enemy, and preventing surprise, they have the highest reputation in Europe, and every effort is made by the German military authorities to maintain and improve their efficiency. In the British army the duties performed by the Uhlans are assigned to the Hussars as well as the Lancers. See also *CAVALRY*.

**UE'LAND, JOHANN LUDWIG**, an eminent German lyrical poet, was born at Tübingen, 26th April, 1787, and died at the same place, 13th November, 1862. In the university of his native town he devoted himself to the study of law, and was admitted to the bar. In 1812 he settled at Stuttgart, and soon after, when the King of Württemberg was about to grant a constitution, descended into the political arena. By his songs, partly published on broadsides, and first collected in 1815, he fought for "the good old right," and gave utterance to the feelings and wishes of the people. In 1819 he was chosen a member of the Württemberg Senate, where his activity as a champion of true constitutionalism was only inferior to his activity and influence as a poet. In 1830 he was appointed professor extraordinary of German literature at Tübingen; but when in 1833 government refused him leave to attend the session of the Senate, he resigned his professorship, and returned to his seat in the chamber. The exertions of the opposition, however, proved of no avail, and Uhland retired into private life in 1839 along with his colleagues. He left Tübingen only once more, when, in 1848, he represented his native town in the Frankfurt National Assembly. We need scarcely add that here, too, he sided with the Left. As a poet Uhland stands at the head of the Swabian school, and combines romantic feeling with classical form and national substance; his ballads and love songs will secure his immortality. His two dramas, "Herzog Ernst von Schwaben" and "Ludwig der Bayer," want real dramatic life and warmth. Of much greater value are his learned monographs on "Walther von der Vogelweide" and on the "Myth of Thor," and his admirable collection of old High and Low German popular songs, which has the only defect of not being completed.

**UIST, NORTH and SOUTH**, two islands of the Outer Hebrides, of which North Uist is situated between Benbecula on the S. and Harris on the N. It is 16 miles long, E. to W., and 12 miles broad. The coast is much indented, Loch Maddy, one of the inlets, having an area of 9 square miles, and there are numerous lakes. The population in 1881 was 3,371. South Uist lies between Benbecula on the N. and Barra on the S. It is 21 miles long by 7 broad, and has an area of about 110 square miles. Both islands have the best land on the west coasts, and though generally level have several ridges of hills, in South Uist, attaining in Mount Hecla, 1990 feet. Gneiss is



the prevailing rock. The ling fisheries are important. The population of South Uist in 1881 was 3810.

**UJJI**, a district on the eastern coast of Lake Tanganyika, Central Africa, about half-way between its centre and northern extremity, bounded N. by the district of Urundi, E. by Ubuhia, S. by Ukaranga, and W. by the lake. The surface is hilly, the soil exceedingly fertile, and the climate humid. It is one of the most productive districts in the region. The principal crops are ground nuts, peas, beans, haricots, and oleus; but sugar-cane, tobacco, and cotton are sometimes raised. Among the fruits are the Guinea palm and the plantain, and among the vegetables are the sweet potato, yam, egg plant, manioc, and cucumber. The inhabitants, the Wajiji, are a large, strong race, with dark skins, which they tattoo, woolly hair, and large, flat feet and hands. What is generally called the town of Ujji, or Kawele, is a collection of huts and mud hovels on the shore of the lake around a raised plot of ground called the bazaar, where the coast Arabs come to trade. It was here that Stanley found Livingstone, 10th November, 1871.

**U'KASE** (Russ. *ukazat*, to point out), a term applied in Russia to all edicts issued by the government respecting legislative or administrative measures. They have the force of laws so long as they are not annulled by subsequent edicts issued in a similar manner. In 1827 the Czar Nicholas caused a collation of all the ukases which had been issued previous to that date to be made, the result appearing in forty-eight volumes. Since then they have been collected year by year, and the whole collection forms the basis of the existing legal code (*swod*) of the Russian Empire.

**U'KRAINE** is a name formerly given to the territory which now forms the governments of Kiev, Podolia, Poltava, and Charkow in Russia.

**ULCERS** (Lat. *ulcus*, a wound). Ulceration has been defined as being "that part or effect of an inflammatory process in which the materials of inflamed tissues liquefy or degenerate; are cast off in solution or very minute particles from free surfaces, or more rarely are absorbed from the surface of the body." Ulceration may attack any organ or tissue, but the portions of the body most disposed to it are the skin, mucous membrane, and connective or areolar tissue. The favourite seats of ulcers on the surface of the body are the legs, the affection being generally due to circumstances favouring weakness of the circulation and lowered vitality, such as exposure to cold and wet, want of food, and standing for long together. Ulcers when present above the knee are usually dependent upon some constitutional affection, such as syphilis or scrofula, or they may be connected with some form of cancer. There are many varieties of ulcers, more than twenty being described by medical writers, but nearly all of them may be grouped into the following divisions:—(1) Simple or healthy; (2) those which do not heal from defect of action; (3) those which do not heal from excess of action; and (4) those which do not heal from peculiarity of action. Of the first class, the simple or healthy ulcer is such as that which follows accidental injury in a healthy person. The surface is covered by small sensitive granulations; the edges are on a level with the surface, of a pink tint, and free from thickening; the surroundings are normal in appearance; and the discharge consists of healthy pus. The pain, except when the sore is touched, is inconsiderable. Treatment consists in rest, in the application of a piece of lint dipped in water, or very weak carbolic acid lotion (1 in 400), covered with a piece of oiled silk to prevent evaporation, and supported by a suitable bandage or piece of strapping. Should the ulcer become weak and the healing process become unduly protracted, a more stimulating lotion is required, one of the best being the preparation of oxide of zinc and compound tincture of lavender, known as "redwash," which should be applied by means of a piece of

lint in exactly the same way as the carbolic acid lotion. Of ulcers of the second class, the most important is the *indolent, callous, or chronic ulcer*. This is frequently met with among old and debilitated individuals, and in most instances it affects the lower part of the leg. The surface is smooth and glassy, is much depressed below the surface, and is surrounded by hard and white edges. The surroundings of the sore are hard and swollen, and the veins in them are frequently made varicose. The discharge is thin, serous, and small in quantity, and there is sometimes a good deal of pain, especially at night. There are several methods adopted in dealing with ulcers of this kind, the essential features in all of them being the exciting of the raw surface so as to procure healthy granulations, and the removal of the thickened surroundings by suitable bandaging. Thus the surface of the sore may be touched with a stick of lunar caustic, or washed with a strongly stimulating lotion, as of carbolic acid 1 to 20, and afterwards may be covered with a mixture of soap and resin plaster, the plaster being perforated with holes to allow the discharge to escape. The strapping must be firmly and evenly applied, and should be renewed every two days. In cases where the ulcer is very old and large, however, it is scarcely possible to do more than limit the sore, for the limb seldom becomes wholly sound, and it has also been frequently observed that the healing of a chronic ulcer in a person of advanced age has been followed by serious symptoms of constitutional disorder. Of ulcers that do not heal from excess of action, the most important variety is the *inflamed ulcer*, which is characterized by much redness, heat, and swelling of the surrounding parts, with a thick offensive discharge often streaked with blood, which causes irritation wherever it touches, the attendant pain being of a throbbing kind. An inflamed ulcer should be treated by rest, the leg being supported on a sofa or chair, and the surface should be kept moist by means of bread poultices or a piece of lint kept constantly wet with a mixture of spirits and water. Sometimes the application of a few leeches round the sore will effect much good, or its edges may be searified with a similar result. Of ulcers that do not heal from peculiarity of action, the more important are the *syphilitic*, which require special local and constitutional treatment, and *varicose ulcers*, which are met with in the lower extremities in connection with distended and varicose veins. The varicose ulcer is of a brownish-red colour, and the edges are hard and somewhat elevated. The skin around is generally swollen and red, and sometimes raw in consequence of a chronic eczematous eruption, and a prominent cord, formed of one or more varicose veins, may generally be seen passing upwards from the superior margin of each ulcer. A vein is sometimes laid open by the extension of a varicose ulcer, and the bleeding which ensues may be of a serious character. In such cases the patient should be placed on his back and his leg elevated, when the bleeding will be arrested, and it may then be restrained by a pad of linen and a few turns of a bandage until surgical aid can be obtained. Treatment consists in the use of the red lotion or some other application of a mildly stimulating kind, and the application of a firm elastic bandage, or what is much better, of an elastic stocking.

In dealing with ulcers attention must be paid to the state of the constitution, for unless this is seen to the best local measures will prove unavailing. In every case nutrition must be carefully attended to, for where the strength is not supported the ulcers will not heal. In cases of weakness and poorness of blood such remedies as quinine, Parrish's chemical food, cod-liver oil, or iron may be required, and where there is any suspicion of a gouty or syphilitic taint, special medicines adapted to these complaints will be called for. The bowels should always be kept freely open, and rest and cleanliness seen to. See also **LEUCUS** and **SCROFULA**.

**U'LEABORG**, a town of Finland, 70 miles S.E. of Tornea, on the Gulf of Bothnia, at the mouth of the river Ulea, which has a north-western course of 60 miles from the large Lake Ulea-Trask. It has an important coasting trade, chiefly in timber, tar, and fish; but the harbour has become very shallow. In winter as many as 200 sledges, laden with tar or timber, arrive in the course of a day. The town has been rebuilt since 1822. The population is about 8000.

**ULEMA** (the Arabic plural of *alim*, a learned man), the collective name of the body of learned men in Turkey. In a general sense ulema are what may be termed "theological jurists," men learned in the Koran and its commentaries, and who derive their decisions in all matters from these authorities. They form a distinct body in Constantinople, whose office is to watch over the correct interpretation of the Koran and the right application of its teachings to law and polity. The head of the ulema is the *Grand mufti* or *sheikh ul-islam*; next to him come the *kaziskiers*, of whom there is one for Europe and one for Asia; the third class are the *mullahs*, the superior judges in the provinces; and after them are the *cadis* and the common muftis. The *kaziskiers* have a voice and vote in the *divan*, and all *cadis* are appointed by and subject to them.

**U'LEX.** See **FURZE**.

**UL FILAS, ULPHILAS, ULFILA** or **WULFILA**, the apostle of the Goths, was born about 311 A.D. in one of the Gothic settlements to the north of the Danube. He is said to have been a descendant of a family of Cappadocian Christians who had been carried off captives by the Goths in one of their predatory excursions some fifty years earlier, and who had continued to profess Christianity, and to cultivate learning among their rude captors. He was brought up a Christian, and being sent to Constantinople, he was first appointed "anagnostes," and afterwards, in 341, as soon as he reached the required age, he was consecrated Bishop of the Goths. After this he returned at once to his own people across the Danube, and laboured among them with so much success during the next seven years as to provoke the anger of the heathen Prince Athanaric, who could not bear a large persecution of the Christians. Ulfilas then applied to the Emperor Constantine for protection, and obtained permission to settle with his people in Moesia territory, near Nikopolis, where they applied themselves to agricultural and pastoral pursuits. Here he laboured till his death, not confining his efforts, however, to his own immediate flock, but still carrying on missions wherever practicable among the Gothic tribes beyond the limits of the empire. Subsequently to the first Gothic immigration, and shortly before the battle of Adrianople in 378 A.D., he seems to have been an unsuccessful ambassador between the Gothic and imperial generals, and in 383 A.D. he visited Constantinople, where he died and was buried with great honour. His errand was to attend a council at which he hoped to find some middle course of conciliation between the Arian and the orthodox form of Christianity; but all such attempts failed hopelessly, and it is said the good bishop died of disappointment, and of grief and indignation at finding his own faith stigmatized by those in power as a heresy. He was one of the chief lights of Arianism, and in the interests of that cause he exerted himself all his life with the utmost energy. His chief title to remembrance, however, is found in his translation of the greater portion of the Old and New Testaments into the Gothic language. To accomplish this he had to invent an alphabet for the language, to settle its grammar, and his *Moso-Gothic* version, as it is called under these circumstances, affords the earliest known text of any Teutonic tongue. The work itself was executed with affectionate pride by the Goths up to the ninth century, but from that period it disappeared until the end of the sixteenth century, when a

manuscript containing the four Gospels, written with silver letters upon a purple parchment, the famous *Codex Argenteus*, was found by Arnold Mercator in 1597 in the Abbey of Werden, near Dusseldorf. It was taken to Prague, where the Swedes found it when they captured the town; and by the Swedish troops it was taken as booty and presented to their learned Queen Christina in 1648. Eventually it passed into the hands of the Count de la Gardie, who, in 1662, presented it to the University of Upsala. This is now preserved in a silver case in the library of the University of Upsala in Sweden. Since that date other portions of the New Testament have been discovered on sundry palimpsests with a few verses from Ezra and Nehemiah, the whole forming an inestimable treasure to the students of philology. The chief editions of Ulfilas are those of Gablentz and Löbe (Leipzig, 1843-60), Massmann (Stuttgart, 1857), Stamm (Paderborn, 1858, &c.; new edition by Heyne, 1874), and that of E. Bernhardt (Halle, 1876). The most recent work of note on the subject is a scholarly monograph, "Ulfilas, the Apostle of the Goths," by Mr. Charles A. A. Scott, which does honour to the University of Cambridge (Cambridge, 1886).

**UL'LER**, the god of winter, of snow, of skating, and of archery, in the Norse mythology. He was the son of Thor by his wife Sif of the Golden Hair, and he ruled Asgard and Midgard in the winter, when Father Wotan had deserted them for a season. He is always the cheery, sturdy, winter-god, ruddy cheeked and hearty, who cares nought for the sharpest wind or snow storm, and who travelled over the whitened plains in huge snow-shoes, or over frozen rivers on skates. The snow-shoes served as a boat for unfrozen waters. Uller was the "swift bowman," and his favourite tree was the bow-making yew. He lived, therefore, in Ydalir, the Valley of Yews. His snows protected the seeds, therefore he was always regarded, though so opposite, as a close friend of Baldr, the god of light. He fell in love with the huntress-goddess Skadi, whom Njord had deserted, and made her his wife.

**ULLS WATER**, one of the most picturesque lakes of England, between the counties of Cumberland and Westmorland; length 9 miles, average breadth  $\frac{3}{4}$  mile; greatest depth, 210 feet. It has three reaches, the middle one of which is the longest, and which, like the Lake of Luzern, present different kinds of scenery, the lower reach lying in a beautifully wooded and smiling country, while the upper one is surrounded by magnificent mountains, and scarcely yields to any of the other lakes in wild and romantic beauty. It discharges by the river Eamont to the Eden, and is 380 feet above the sea-level.

**ULLU'CO** or **MELLO'CA** (*Ullucus tuberosus*) is a plant extensively cultivated in the Andes of Bolivia and Peru for the edible tubers produced by the stem. It is a fleshy herb with a weak stem, from 1 to 2 feet long, which is either prostrate or twines round bushes, and throws out branches, which bear little yellow tubers resembling potatoes. The tubers, called *oca yucas* by the natives, are about the size of a hazel-nut, waxy and yellow. They were proposed as a substitute for the potato during the famine caused by the failure of the crops in 1846-49, but were not found palatable. In the elevated regions of the Andes, however, they are eaten by the natives, who prepare them for food by alternately freezing and steeping them.

**ULM**, a city of Württemberg, in the German Empire, situated in a beautiful and fertile country at the southeastern foot of the Swabian Alps, and on the left bank of the Danube, which is here joined by the Blau. The city is of elliptical shape, and the ground on which it stands is tolerably level. Like most of the old German towns, it has in general irregular and crooked streets, and antique-looking wooden houses; there are, however, some broad handsome streets, with flag-pavement for foot passengers. Three bridges connect the town with the Bavarian village

of New Ulm, on the right bank of the river. Ulm has many buildings worthy of notice. The Minster, a very fine specimen of ancient Gothic architecture, and one of the largest and loftiest churches in Germany, is 485 feet long, including the choir, 200 feet broad, and the middle aisle 150 feet high. The steeple is 337 feet high, but has never been carried to the height of the original design. The building was carried on between 1377 and 1494, and has been in course of completion and restoration since 1843. It is used as a Protestant place of worship. The town-house, a very ancient and spacious edifice, contains many fine paintings. The Deutsche-Haus, containing the principal public offices, is considered the handsomest and most regular building in the city. Besides the Minster there are Lutheran and Roman Catholic churches. There are a theatre, a gymnasium, a museum, a city library, a large hospital, and numerous charitable institutions. In 1880 the city had 32,773 inhabitants, who manufacture linen, cotton, woollen, silks, paper, leather, snuffs, tobacco, tobacco-pipes, porcelain, &c. The town is also noted for a kind of pastry, called Ulmer bread; there are some breweries, and ship-building yards and printing establishments. Bleaching is carried on in the vicinity, and there are some extensive gardens near the city—aspargus especially being cultivated in very large quantities. There is a very considerable transit trade. Steamers and barges ply between the town and Vienna. Ulm capitulated to Napoleon 17th November, 1805, General Mack and the Austrian garrison of 28,000 men being made prisoners without having fired a shot.

**ULMIC ACID** or **ULMIN**, the name first given by Klaproth to a dark brown substance obtained from the black excreescences on the stems of certain trees, particularly the elm (*Ulmus campestris*, natural order Ulmaceæ). It is generally present in vegetable mould, peat, and other products of decay, and forms the pigment known as humus which gives the dark colour to rich and well-manured soils. It is also obtained by the action of acids and alkalis on sugar, starch, cellulose, and many other vegetable products. The formula of ulmic acid is  $C_{24}H_{14}O_8$ . It is a dark brown substance, soluble in pure water, but insoluble in water containing an acid. It is easily dissolved out from a soil by a weak solution of potash or soda, which, on the addition of hydrochloric acid, yields the ulmic acid as a dark brown amorphous precipitate. It is present in all fertile soils, and appears to have an important influence on the growth of the plants and the retention of ammonia in the soil.

**ULNA** (Lat., Gr. *ὀλῆ*) is the larger of the two bones of the forearm, forming the elbow-joint, and being articulated to the radius and the humerus. \*See ARM.

**ULPIAN** (*Domitius Ulpianus*), the celebrated lawyer, was born of a Tyrian family in the latter part of the second century, and flourished under the emperors Caracalla, Elagabalus, and Alexander Severus. Having attained a great forensic reputation and considerable political influence, he was banished by the tyrant Elagabalus, but was recalled by his successor. With Alexander Severus Ulpian had great influence, which, however, proved fatal to himself, for being appointed by that emperor to the important office of præfectus prætorio, he was slain in the very presence of the emperor and his mother by the mutinous soldiery, who dreaded the strictness of his discipline, in 228. His legal writings were very numerous, and possessed unusual weight with subsequent jurists, by whom large extracts have been preserved to us. With Tribonian and his coadjutors, by whom the famous Digest of Justinian was prepared, the authority of Ulpian was held in such esteem that the extracts from his works amount to about one-third of the entire Digest. He may, therefore, be considered one of the principal exponents of Latin jurisprudence, and has thus indirectly exercised no slight influence on the civil law of modern Europe.

**ULPIAN BASILICA.** See FORUM.

**ULPIUS TRAJANUS, MARCUS.** See TRAJAN.

**ULRICI, HERMANN**, a German philosophical writer and litterateur, was born at Pförten, Lusatia, on 23rd March, 1806. At the desire of his father he studied law, but on the death of his father he turned to philosophy and literature. In 1833 he began lecturing at Berlin, and in the following year obtained an extraordinary professorship at Halle. Ulrici won for himself a position both in the field of philosophy, in which he opposed Hegel, and in that of literary history. We note his "Grundprincip der Philosophie," two vols.; "System der Logik;" "History of Hellenic Poetry," two vols. (1835); "Gott und Natur" (1862); "Gott und der Mensch" (1866); and especially his work on Shakespeare (1839), entitled "Über Shakespeare's Dramatische Kunst," two vols. This book, displaying remarkable ingenuity and insight, has been translated into English by Dr. L. Schmitz, and is considered even in this country as one of the ablest treatises on the subject. One of the marked peculiarities in it is the earnest attempt to show from the plays that Shakespeare was a Protestant.

**UL'STER**, the northernmost of the four provinces into which Ireland is divided. It is bounded on the N. and W. by the Atlantic Ocean, E. by the Irish Sea, S.E. by the province of Leinster, and S.W. by that of Connaught. It comprehends nine counties, viz., Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone. The area of the province is 8569 square miles, and the population in 1881 was 1,743,075.

Ulster is mountainous, and more free from bogs and plains than the other parts of Ireland. Two mountain groups cross the province from east to west. The northernmost, which passes through the counties of Antrim, Londonderry, and Donegal, is divided into three parts by the valleys or depressions through which the Bann and the Foyle reach the sea. The mountains of Donegal are the loftiest; several of the peaks rise to the height of more than 2000 feet, and one (Erigal) is 2160 feet above the level of the sea. The coast of Donegal is very rugged, marked by deep inlets, as Lough Swilly and Lough Foyle (between Donegal and Londonderry), stupendous cliffs, bluff headlands, and numerous islands. The southern mountains commence on the east coast, in the county of Down, where Slieve Donard, one of the Mourne Mountains, rises to the height of 2796 feet above the level of the sea. The other mountains in the southern part of the province are lower, and extend through the counties of Monaghan, Cavan, and Fermanagh. A lower and comparatively level district intervenes between the northern and southern mountains, and occupies a considerable part of the counties of Down, Armagh, and Tyrone, extending from Belfast Lough and Strangford Lough on the east to Lough Erne and Lough Derg on the west. Lough Neagh is in this central low country.

The mountains of Donegal and Londonderry are chiefly of mica-slate, except in the north-west of the former county, where they consist of granite and quartz rock. The mountains of Antrim are of tabular trap. The basaltic rocks known as the Giant's Causeway occur on the north coast of this county.

The Mourne Mountains are granitic; the other southern mountains consist of graywacke, graywacke slate, old red sandstone, yellow conglomerate (the lowest member of the carboniferous limestone series), and millstone-grit.

The principal rivers flow from south to north, rising in the southern mountains, crossing the intermediate low country, and passing through openings in the northern mountains into the Atlantic. Several flow in different directions into Lough Neagh, of which the Bann is the outlet. Others unite in the Foyle. The principal lakes are Lough Neagh, in the centre of the province; and

Lough Erne, Lough Derg, Lough Macnean, and Lough Nilly, in the south-west. Belfast Lough, Strangford Lough, and Loughs Larne, Foyle, and Swilly are land-locked inlets of the sea.

Ulster was one of the five provinces into which, at an early period, Ireland was divided. In it the northern Hy Nialls or O'Neills had their seat. In the Anglo-Norman invasion the earliest attack upon Ulster was made in 1177 by John de Courcy, who conquered part or the whole of Ulidia (now the county of Down and part of Antrim), and extended his incursions, with varying success, into other parts of the province. He assumed or received the title of Earl of Ulster, but on his decease his land and titles were transferred to Hugh de Lacy, and the title was inherited by the De Burgh and Mortimer family. The greater part of the province remained, however, in the hands of the native chieftains until a comparatively late period. Insurrections having, in 1607, led to extensive forfeitures in the six counties of Donegal, Tyrone, Coleraine (now Londonderry), Fermanagh, Cavan, and Armagh, it was determined to bestow them on English or Scotch colonists, "servitors in Ireland," or on natives of Ireland who were to be made freeholders, all termed "undertakers," to whom were severally assigned lots of 1000, 1500, and 2000 English acres, upon different tenures, on condition that they should build on each of the largest (or 2000 acre) grants a castle, and on each of the other grants a brick or stone house, each castle or house surrounded by a strong courtyard or *bawn*, and should settle or plant a certain number of tenants, who were to be Scotch or English, except on the lands of the Irish servitors, who might take English or Irish tenants at their choice. Large grants were assigned to the corporation and some of the trading companies of the city of London, from which the town and the county of Down received the distinctive prefix of their name, Londonerry.

In consequence of the large infusion of English and Scotch blood in this province, the Celtic race is by no means so pure or numerous as elsewhere in Ireland, and for the same reasons there are not so many Roman Catholics the percentage being 47·8 Roman Catholics and 49·7 Protestants. Ulster is the headquarters of the Irish linen manufacture, the chief seat of which is Belfast.

**ULTIMATUM**, the final propositions, conditions, or terms offered in diplomacy as the basis of a treaty. It may be considered as the most favourable terms that can be offered, and its rejection usually puts an end to negotiation.

**ULTRA-BASIC ROCKS** are igneous rocks containing a very small percentage of silica, and attaining an unusually high specific gravity, more than 3. They are almost entirely composed of the minerals which occur in meteorites (see **ACHOLITES**), and rarely reach the earth's surface, probably being derived from the greatest depths ever affected by volcanic disturbances. **Pierite** and **LHERZOLITE** are examples, also the basalt containing metallic iron at OVIKAK, in Greenland.

**ULTRAMARINE** (Lat. *ultra*, beyond, and *mare*, the sea) a well-known blue pigment of extraordinary branty and great permanency. It was originally, and indeed, until within a few years, entirely prepared from the **LAPIS LAZULI** or lazulite, and was so costly as to be made the subject of special stipulations by the patrons of artists to prevent the latter using substitutes. Sometimes the patron preferred to buy and supply the pigment himself. Sir Peter Lee notes that he paid £4 10s. an ounce. It is now, however, artificially produced at a very moderate price, and equal in beauty to that obtained from the lazulite. Gmelin considers that sulphuret of sodium is the enclosing principle both of the natural mineral and the artificial products. The artificial ultramarine is made on a large scale in porcelain factories. The manufacturers

use a mixture of pure china clay, or kaolin, with carbonate and sulphate of soda, charcoal, and sulphur. The usual proportions are as follows:—

Kaolin, . . . . .	100 parts.
Carbonate of soda, . . . . .	41 "
Sulphate of soda, calcined, . . . . .	41 "
Charcoal, . . . . .	17 "
Sulphur, . . . . .	13 "

The mixture is ignited in covered fireclay crucibles at a high temperature, and the ultramarine thus obtained, which is green in colour, is finely ground, and roasted with further addition of sulphur to form the blue ultramarine. Artificial ultramarine was first discovered in 1828 by Guimet, and a prize of 6000 francs was awarded to him by the Société d'Encouragement of Paris. The original process was kept secret, but was similar to that here given, which was published by Gmelin soon afterwards. The composition of the pure blue pigment, according to Wilken's analysis, is  $(2\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2) (\text{Al}_2\text{O}_3 \cdot 18\text{SiO}_2) (\text{Na}_2\text{S}_2\text{O}_3 \cdot 3\text{Na}_2\text{S})$ . It is a sodio-aluminic silicate, combined with sulphide and hyposulphite of sodium. The actual blue colour is understood to be a compound of hyposulphite and sulphide of sodium, and is often seen on the surface of molten caustic soda containing sulphur compounds. Heated in the air it becomes green. Sulphuric, nitric, hydrochloric acids and chlorine quickly decompose ultramarine and destroy the colour, and it gives a colourless glass when fused with borax. It is much employed in dyeing, calico-printing, paper staining, and as an artists' colour in painting. There are a number of large manufactories in Germany, which turn out over 20,000 tons per annum, and there is a good deal made also in France and Belgium, but very little in this country. Cobaltic ultramarine is a very rich blue pigment, prepared by slowly drying and heating to dull redness a mixture of freshly precipitated alumina (freed from water as much as possible), 8 to 10 parts, arseniate or phosphate of cobalt, 1 part. By daylight it is a pure blue, but by artificial light the colour turns to a violet.

**ULTRAMONTANE** (Lat. *ultra*, beyond, and *montes*, mountains, i.e. the Alps), the name formerly applied to all theologians in the Roman Catholic Church who advocated the doctrine which elevated the Pope to a position of feudal supremacy, and declared that his decrees had force in themselves, independently of their acceptance by the body of bishops. The name originated with the French Gallicans, who denied to the Pope all right to depose sovereigns or to interfere in the temporal affairs of states and of national churches, and maintained that the doctrinal judgments of the Pope only became infallible and binding on the conscience when confirmed by the consent of the church, and that the authority of a general council is superior to that of the Pope. The contrary view being held "beyond the Alps," or by the Italian party, its supporters were called *Transalpine* and *Ultramontani*. At the Council of Constance, where these adverse opinions came conspicuously into conflict, the designation of Ultramontane was extended to persons of every nationality who denied the superiority of the council over the Pope. After that council the question of the direct or indirect power of the Pope over states and sovereigns became the chief point of dispute, and the question everywhere assumed a national character. In Germany Febronius (Bishop Hontheim) wrote a powerful work against Ultramontanism, and in 1786, at the convention of Eins, the archbishops of Mentz, Trèves, Cologne, and Salzburg denounced it. Even in Italy it found a powerful opponent in Scipione Ricci, bishop of Pistoja, who convened a synod in that city in September, 1786, and promulgated disciplinary decrees and a doctrinal exposition favouring extreme Gallicanism. These were partly confirmed on 23rd April, 1787, by an assembly of the bishops of Tuscany but the Acts of the Synod of Pistoja

were condemned by Pius VI. in the dogmatic bull, *Auctorem fidei*, of 28th August, 1794. The Jesuits have always been the most strenuous upholders of Ultramontaniam, and their influence was felt very strongly at the Vatican Council of 1870, which asserted the dogma of papal infallibility. As the decrees of that council have been accepted by the vast majority of Roman Catholics, the term Ultramontane has lost some of its old significance, and at the present day it is bestowed on all who advocate the highest spiritual power of the Pope, and who refuse to acquiesce in his loss of temporal power.

**ULUNDA**, an extensive country of Southern Central Africa, chiefly in the basin of the Kassabi tributary of the Congo. Its ruler is the hereditary Mata Yafa or Muata Yainvo. The Walunda are a dirty, white-looking race, wearing skin aprons or shreds of bark cloth.

**ULVERSTON** (locally pronounced *Ooston*), a market-town of England, in the county and 15 miles north-west of Lancaster, 256 miles from London. It stands on the north-western side of Morecambe Bay, with which it is connected by a short canal. There are extensive slate quarries in several parts of the parish, and numerous iron mines within a short distance. The town is pleasantly situated on a declivity sloping to the south, and about a mile from the sands on the estuary of the Leven. It consists of four principal streets, spacious and clean. The parish church is a plain neat structure, and there are several places of worship for dissenters, grammar and national schools, a concert hall and temperance hall. It has blast furnaces, boiler works, a shoe factory, and a paper mill. The canal from the estuary of the Leven in Morecambe Bay enables vessels of 200 tons to come up and discharge their cargoes in a spacious basin close to the town, and regular steamboat communication is maintained with Liverpool. The population of the parish is 13,394; of the township, 10,008. Ulverston is an old-fashioned town, the capital of the Furness district, and was granted, with a manor attached, to the Abbey of Furness by King Stephen, A.D. 1217. Its name is supposed to have been derived from Ulfhus, a Saxon noble who extended his conquest to Furness. Its commercial status was considerably increased by the canal made in 1795, under the direction of Rennie.

**UL'WAR.** See **ALWAR.**

**ULYSSES, ULYXES, or ULIXES**, the names under which the Greek hero Odusseus was known among the Romans. See **ODUSSEUS.**

**UMBAL'LA.** See **AMBALA.**

**UMBEL**, in botany, is a form of inflorescence in which there are several flower-stalks all radiating from a common point, and of nearly equal length. The umbel is especially characteristic of the order **UMBELLIFERÆ**. It is often compound, the primary stalks dividing into secondary sets of radiating flower stalks, and thus forming *umbellules*, or secondary umbels.

**UMBELLIFERÆ** is a natural order of dicotyledonous plants belonging to the group Polypetalæ, cohort Umbellales. [See **BOTANY.**] This is a large and important order, containing about 1300 species. These are principally inhabitants of the northern temperate zone, and the greater number of them are found in the Old World.

Their properties are variable and very important. One of their distinguishing characters is the possession of an acrid principle in solution in the watery juices of the plant, which finds its full development in such plants as the Hemlock (Conium), the Cowbane (Cicuta), Dropwort (Eranthis), Fool's Parsley (Æthusa), &c. This renders the whole order suspicious.

Another important secretion of the Umbellifæræ is an aromatic volatile oil, which is deposited chiefly in the canals of the pericarp, which are called *vittæ*. In some species it is more abundant than in others; and on this

account the fruits, commonly called the seeds, are used frequently in diet as a condiment, and in medicine as an aromatic and carminative. Of these the carraway, the anise, the dill, the cummin, and coriander are among those best known.

A third secretion of these plants is a gum-resin. This probably, like the two last secretions, is common to the whole order, but is fully developed in only a few species. The gum-resins produced by this order have had a great reputation in medicine, and many of them are still looked on as valuable remedies. The laser, or thapsia, of the ancients, is secreted by plants belonging to this order, and asafœtida, galbanum, gum-ammoniac, opoponax, and sagapenum are much used as stimulant medicines in nervous diseases at the present day.

In some species the noxious principles are little developed, and are rendered harmless under cultivation. The blanched stems of the celery, rendered succulent by cultivation, are eaten. In others starch is deposited in large quantities in the roots, rendering them important articles of food; such are the carrot, parsnip, and skirret. The tubers of the pig-nut or earth-nut are edible. The leaves of par-ley, fennel, chervil, &c., are used in flavouring.

The Umbellifæræ are herbs, rarely shrubs, most rarely trees. The stems are usually furrowed and fistular. The leaves are alternate, without stipules, sheathing at the base, and generally deeply divided. The flowers are regular, hermaphrodite, generally arranged in simple or compound umbels, rarely collected into a head; each umbel or umbellule is generally furnished with an involucre of bracts. The tube of the calyx is completely adherent to the ovary; and the limb is five-toothed or absent. The petals are five, springing from the outside of an epigynous disc, sometimes bifid, the outer often the largest. The stamens are five, alternate with, and inserted like, the petals. The ovary is inferior, two-celled, composed of two coherent carpels, with two styles, a single ovule in each cell. The fruit separates into two dry one-seeded mericarps, which often remain suspended at the top of a forked prolongation of the axis (carpopophore). The surface of each mericarp is marked with longitudinal ridges, five primary, and sometimes four secondary. Beneath the furrows separating the ridges are longitudinal oil-bearing canals (vittæ). The seed is pendulous, free or adherent to the pericarp. It is chiefly from the arrangement of the ridges and vittæ that the distinction of the genera is determined.

The order is divided by Bentham and Hooker ("Genera Plantarum") into the following tribes:—Hydrocotyleæ, Mulinæ, Saniculeæ, Echinophoreæ, Amminæ, Sceselineæ, Pencedanæ, Caucalineæ, and Lasericæ.

**UMBELLIFERONE**, a neutral body obtained from galbanum. It is isomeric with quinone, and crystallizes in colourless prisms, having the formula  $C_8H_4O_2$ . It is slightly soluble in cold water, very soluble in boiling water, the solution setting into a crystalline mass on cooling, and soluble also in alcohol and ether. The aqueous solution is colourless, but it gives a blue reflection. The colour is deepened by alkalis, but destroyed by acids. The crystals melt at  $240^{\circ}C.$  ( $464^{\circ}Fahr.$ ), and sublime without decomposition. Umbelliferone combines with bromine, forming dibromumbelliferone ( $C_8H_2Br_2O_2$ ), which is colourless, but the alcoholic solution gives a light-green colour by reflected light.

**UMBILICAL CORD** (Lat. *umbilicus*, the navel), in anatomy, the navel-string or cordlike intestinal substance that unites the fœtus to the centre of the placenta. It is about 18 inches long, and is a cellular substance, composed of a cutaneous sheath, two umbilical arteries, and one umbilical vein. The arteries convey the blood from the fœtus to the placenta, and the vein carries it from the placenta to the fœtus. The surrounding portion of the

abdominal parietes, of about 4 inches in diameter, is called the umbilical region.

**UM'BRA.** This Latin word, meaning shadow, has been used to signify the real shadow of the earth or moon in an eclipse; the term *penumbra* is retained, to signify that portion of the heavens which is partially shaded. If the sun were a mere point of light the shadows of the earth or moon would be simply umbræ; but the sun is so much larger than either of them that the light from both edges of his disc has to be considered, and it is at once manifest that there will be a large shadowed space wherein the right side of the disc is visible, although the left side is invisible and casts a shadow; and so for other parts of the disc. The umbra is the shadow where no portion of the sun is visible.

**UMBRE** (*Scopus umbretta*) is a bird belonging to the STORK family (Ciconiidae). The umbre or brown stork is a native of South Africa, from Cape Colony to the Zambesi River. It frequents ponds, marshes, rivers, and lakes, preying on frogs, small fishes, &c. The nest is a huge structure of sticks placed on trees and rocky ledges. According to Mr. Layard the nest is sometimes 3 yards long and 18 inches in diameter, with one small aperture, which is placed in the least accessible side; it is adorned with buttons, bits of crockery, and anything bright and glittering which the bird picks up. The umbre is about the size of a crow. The entire plumage is of a brown colour, and the male has a well-developed crest on the back of the head. The bill is much compressed; the upper mandible is furrowed along the sides and has a curved or slightly hooked tip.

**UMBRELLA** (diminutive of Lat. *umbra*, a shade), a folding shade or screen carried over the head as a protection from rain or sunshine. When small, and used by ladies only as a sunshade, it is called a parasol, from the Italian *parere*, to ward off, and *sole*, the sun. As might be expected, umbrellas, for the purpose of protecting the head from the sun, are of remote antiquity. The idea would naturally suggest itself to nations suffering from the rays of a tropical noonday, and umbrellas, not unlike the gig umbrellas of the present time, are frequently found depicted among the wall pictures and sculptures of Egypt and Nineveh. It appears in these countries to have been regarded as an emblem of royalty or mark of distinction, as in Assyria its use was limited to the king, and in Egypt it was only carried over persons in authority. In China and India its use is very ancient, and in the latter country it seems to have had a religious significance, Vishnu in his fifth incarnation being spoken of as going down to the infernal regions bearing an umbrella in his hand. In these countries, also, the umbrella was included among the insignia of royalty, and it is believed that its use in this respect caused it to be adopted as the final termination of the roofs of the pagodas and temples. The Buddhist *topes* and Chinese *pagodas* are, it is said, nothing more in design than a series of umbrellas raised one above another, but another theory makes the tent of the nomad the original type of both. The title of "Lord of the Umbrella" was formerly much coveted by Marhatta princes, and the King of Burma, before the annexation of that country by the British, included, among his other titles, that of "Lord of the Twenty-four Umbrellas." In Siam the umbrellas of the king are made with several separate circles, one above another, while the nobles use them with a single circle only. From the East the useful invention was imported into Greece, and in the Skirophoria, the feast of Athena Skiras, a white parasol was borne by the priestesses from the Akropolis to Phaléron. The umbrella was also used in the celebration of the feasts of Bacchus. From Greece the use of the umbrella passed to Rome, and the Roman women appear to have used umbrellas very much like those of the present time. During the middle ages

there are occasional references to umbrellas, and the broad red hat of the cardinal is believed to be a modification of the umbrella. It is certain that, in the basilican churches of Rome, a large umbrella used to be suspended, and the cardinal who took his title from the church had the privilege of having an umbrella carried over his head in solemn processions. In the Harleian MSS. there are some representations of the umbrella, the MS. No. 603 showing an Anglo-Saxon gentleman walking out, attended by his servant carrying an umbrella with a sloping handle, by which he holds it over the head of his master walking in front. Until a comparatively recent period umbrellas were used in Italy and France only as a protection from the sun, but about the reign of Anne they came into general use in London as a protection from the rain, but were carried only by women. Kersey's "English Dictionary," published in 1708, defines umbrella as a "screen commonly used by women to keep off rain." The first male who boldly ventured into the public streets, umbrella in hand, was the eccentric philanthropist, Jonas Hanway, who suffered from ill health. This was about 1750, and the innovation was at first much resented by the populace. The small boys followed the umbrella bearer with shouts and jeers, and the hackney coachmen, who felt a trade jealousy in the matter, saluted him with rude remarks. After a time his example was followed by others, and though umbrella bearers, as effeminate persons, were at first the butts of all the wits, Hanway had the satisfaction, before his death, of seeing his example very generally followed. The first umbrellas were very substantial and bulky affairs, the framework being of cane or whalebone, and the covers being made of oiled silk or glazed calico, but after a time these gave way to gingham, and it in turn gave way to alpacin, silk, and mixed fabrics. About 1810 light frames of metal were introduced, and a further important improvement was made in 1852, when Samuel Fox patented the paragon ribs and stretchers. These are of sheet steel rolled in a semi-elliptical shape, so as to combine the least weight of material with the greatest strength. Since then most improvements have been in the direction of reduction of weight and perfection of mechanism. It is a curious fact that, while the Patent Records show over 300 patents between 1780 and the present day for improvements in umbrellas, very few changes of any practical value have been produced. At the present day umbrella-making is an important industry, giving employment to a large number of persons, the metal furniture being principally made at Birmingham and Sheffield, while London and Manchester are the chief seats of the making-up industry.

**UMBRELLA-BIRD** (*Cephalopterus ornatus*) is a bird belonging to the family Ampelidæ (CHATTERERS), remarkable for its singular crest, which resembles an umbrella. The bill is stout, long, flattened, and slightly curved. The wings are moderate and rather pointed. The tail is short and rounded. The umbrella-bird is about the size of a crow, which it also resembles in the glossy black colour of its plumage. The head of the male is adorned with a large spreading crest, composed of from fifty to eighty long slender feathers, springing from a contractile skin on the top of the head. The shafts of the feathers are white, and the plumes black with blue reflections, hair-like, and curved outwards at the tips. When the crest is unexpanded, the shafts form a compact white mass, sloping up from the top of the head, and surmounted by the dense hairy plumes. When erected, the feathers spread in all directions, reaching forward so to completely cover the bill. In this state this singular crest is about 5 inches in length and 4½ inches in breadth, and is of a beautiful shining blue colour. The umbrella-bird also possesses another singular ornament, the like of which is not found in any other bird. The skin of the neck is very loose, and from it grows a cylindrical fleshy process about as thick as



a goose-quill and  $1\frac{1}{2}$  inch long. This is covered down to the very point with imbricated feathers, black, bordered with fine metallic blue, the whole forming a long cylindri-

cal plume, either carried close to the breast or puffed out and hanging down in front of it.

The umbrella-bird is a native of tropical South America,



The Umbrella-bird (*Cephalopterus ornatus*).

being found chiefly on the islands of the great rivers. It is arboreal in its habits, and feeds principally on fruits. It utters a very loud, deep note, for which reason the natives of the region bordering the Rio Negro call it the Piper-bird.

**UMBRIAN SCHOOL, THE**, of painting, for ever memorable as having culminated in Raffaele, was in its origin as purely the home of spiritual beauty as was the Siennese school of richness and elegance and the Florentine of perfection of form. The strong influence of St. Francis of Assisi saturated the whole district with intense religious feeling, and this manifested itself as surely in the methods of the painters as in every other work of fine art. At length in Nicolo Alunno a definite school of expression arose, and the spiritual beauty of the elder master was carried to perfection at the hands of his far greater pupil Perugino (1446-1524), who in turn became the master of the incomparable Raffaele (1483-1520). Raffaele's early works are purely Umbrian and Peruginian, but he soon developed a wondrous style of his own, and passed away from and above all schools. Another pupil of Perugino, Pinturicchio (1451-1513), who worked in the Sistine, and especially in the noble library of Siena Cathedral (his masterpiece), remained true to the school. The Spanish painter L. Spagno, whose name was Giovanni di Pietro (died 1530), was also an ornament of the school of Perugino.

Held by some as even greater than Perugino in the quality of spiritual expression, and admitted by all to be fully his equal, was Francia (1450-1517), whose name was Francesco Raibolini, a native of Bologna. He was a fervently pious man, and his lofty character shines in his works. We have the fortune to possess a very fine example of Francia in the National Gallery, a far finer work than any Perugino we as yet possess.

A school which could produce in the hill-towns of the

Apennines two such giants as Perugino and Francia, so excellent a painter as Pinturicchio, and serve as nurse to the immortal Raffaele, must be held to have done remarkable work. And there is no doubt whatever that it was the pure, religious spirit which urged on the artists of the Umbrian school that was the cause of their success, for some of them were even faulty in points of drawing. In spiritual beauty of expression, however, they are uniformly successful.

**UMBRIANS or OMBRIANS, THE**, were one of the oldest peoples of Italy. They appear at a very remote period in the highlands of the Central Apennines, whence they descended into the valleys of the Tiber and the Nar. They spread from the Mediterranean across the Apennines, to the coast of the Adriatic. The Umbrian or Umbro-Sabellian stock probably formed the second wave of the Italian people, coming after the first or Latin wave, and at first lying to the north of the settlements of the latter. When the Etruscans appeared (and no one as yet has fairly shown from whence) they drove the Umbri westward and southward before them, and became the dominant race in the land ever since called after them Tuscany. The Umbrians now divided, some holding Umbria proper, the country between the arms of the Apennines, others advancing southward on the Apennine heights, to found the great Samnite or Oscan nation of the south, and the Sabine-Volsian nation of the centre. The Latin race, headed by Rome, overthrew first the Sabines, then the Volsians, then the Umbrians, and finally the Samnites. The Umbrians of Umbria proper joined the Etruscans against Rome, but about B.C. 307 they acknowledged the Roman supremacy. They had lost the sea-coast to the Senones, a tribe of Gauls, before this date.

Umbria, under the Roman republic, was one of the divisions of Italy proper, extending from Oriculum on the south to Ariminum and Pisaurum on the Adriatic coast

after the Senones had been driven from their conquest. On the east the river Æsis separated it from the Picenum, and the Nar from the Sabinium. On the south it bordered upon Latium, and on the west upon Etruria. The Rubicon (Lat. *Rubico*), a small brook rather than a river, formed its boundary towards Cisalpine Gaul.

**UMPIRE.** The word *umpire* (really not an *umpire*, but a *numpire*, i.e., a non-pair or third party) is sometimes used to denote the person who, in the first instance, decides a controversy; but in its legal sense it means a person named in the submission, or under its authority, by the arbitrators [see **ARBITRATION**] to decide the matters referred, which the arbitrators either cannot or will not decide. The rules which govern an arbitrator also regulate the conduct of the umpire. In Scotland the umpire is usually called *oversman*.

**UMRITSUR.** See **AMRITSAR**.

**UNAU.** See **SLOTH**.

**UNCARIA** is a genus of plants belonging to the order RUBIACEÆ, tribe Cinchonaceæ. *Uncaria gambir*, a native of the Malayan region, yields the substance known in commerce as gambier, pale catechu, or terra japonica. [See **CATECHU**.] It is a climbing plant in the wild state, but under cultivation forms a bushy shrub, 7 or 8 feet high, with smooth oblong or ovate leaves. The upper flower-stalks bear dense globular heads of green and pink flowers, while the lower ones are barren and converted into hard woody spines, directed downwards so as to form hooks. The gambier is an extract obtained from the leaves by boiling them. Among the Malays it is chewed, mixed with areca and betel-nut; but in this country it is used for dyeing and tanning purposes, and also medicinally. The genus *Uncaria* is now generally combined with *Nauclera*, which includes a large number of shrubs and trees, chiefly natives of tropical Asia.

**UNCIA**, the same word as the Greek *συνος*, and signifying, like it, both weight and size, came to be the Latin term for the twelfth part of the *as* (pound), and also of the *pes* (foot). It is indeed remarkable, as a proof of the vitality of words and their meanings, which apparently should be the most easily destroyed of all things, since

"A breath can make them as a breath has made,"

that the Latin *uncia* of weight remains in our word "ounce," and the uncia of measure in our "inch." Moreover, the uncia was  $\frac{1}{12}$  of our present inch and  $\frac{1}{168}$  of our ounce avoirdupois, which, for ordinary measure and weight, may be taken as amounting to identity.

**UNCIALS**, large MS. letters, originally as much as an inch high, deriving their name from *uncia* (Lat., inch). The earliest form of the Greek and Latin languages is preserved in their capital letters; originally the entire manuscripts, and not merely certain important words, were so written. Later on, in mediæval times, an easier form of capitals, capable of being written more rapidly, as the lines were frequently curved and the letters simplified, largely took the place of the pure square capitals. This was the uncial style, and it lasted from the sixth to the eighth centuries in great vigour. Small-hand letters (minuscules) then began to arise, and soon drove uncials before them, but the latter did not die out before the tenth century.

**UNCONFORMABILITY**, a term employed by geologists to denote a discordance in the parallelism of two sedimentary strata overlying one another. In such a case the upper deposit rests upon the denuded edges of the lower, and the last-named is generally more or less tilted with reference to the first. An unconformability therefore implies a temporary interruption in the deposition of sediment at the spot where it occurs, and it often denotes a long lapse of time, accompanied by great changes in the fauna and flora and geography of the area in question.

Good examples of this arrangement of strata are met with in the middle of the SILURIAN SYSTEM, between the PERMIAN and TRIASSIC SYSTEMS, and at the top of the English chalk.

**UNCONSCIOUS CEREBRATION.** See **CEREBRATION**, **UNCONSCIOUS**.

**UNCONSCIOUS, PHILOSOPHY OF THE.** This scheme of philosophy, due to the German metaphysician K. R. E. von Hartmann, strongly resembles in general bearing the speculations of Schopenhauer. The "*Philosophie des Unbewussten*" appeared at Berlin in 1869, and in a second and greatly enlarged form in 1871. Its basis is a form of monism, the universe being explained by the hypothesis of an unconscious spirit with the two attributes of will and idea (or representation). Von Hartmann quarrels with Hegel for his doctrine of the "logical idea," as being inefficient to attain reality without will; while on the other hand the "will" of Schopenhauer, blind and irrational, is not capable of attaining the representation of ideas. He therefore demands that both will and idea shall be regarded as equal and alike as functions of the functionary essence, the *unconscious*. From the will we get the *dass* (the "that," the real existence), from the idea we get the *was* (the "what," the ideal essence), which together make up the universe. That the world thus created is the best of all possible worlds Von Hartmann labours to prove (optimism), but he is equally concerned to show that it had been better if it had never existed (pessimism), and that we should place our best hope in the prospect of a gradual annihilation of the will, and our more or less speedily reaching the unconscious whence we emerged.

**UNCTION** (Lat. *unctio*, an anointing, from *ungō*, I anoint), the practice of anointing the body or inanimate objects with oil. The use of oil from motives of health or luxury dates from a very remote period, and the same may be said of its use in connection with religion. In those forms of nature-worship in which the reproductive element was an object of veneration, a stone or wooden pillar was frequently used as a Phallic symbol, and consecrated by the pouring of oil upon the top. An illustration of this custom, but having a different significance, is given in Gen. xxviii. 18-22. Sacred stones having the primitive symbolism are still set up in some parts of India, and it is customary for newly married women and those who desire offspring to sit upon the sacred stone after first pouring oil upon the top. The old custom continued to be observed after the primitive nature worship had given way to higher forms, and we find among the Hebrews the tabernacle and all its furniture were consecrated by anointing, the priests being set apart for their duties by a similar rite. At a later period kings as well as priests were consecrated by anointing, "Jehovah's anointed" being the title frequently given to the Jewish kings. This title is used as late as the Captivity, and it is subsequently applied to Cyrus, while the promised Deliverer of the nation is especially designated the "anointed one." In the Christian Church anointing was retained from the earliest period, and we find it was considered efficacious for the healing of the sick (compare James v. 14), a survival of this use being found in the sacrament of **EXTREME UNCTION**. It was afterwards employed in baptism, confirmation, in the ordination of the clergy, and in the consecration of churches and altars, and the practice is still retained in the Roman Catholic Church.

**UNDERCLAY**, in geology, the technical term applied by miners to the tenacious bed of fire-clay usually met with underlying each seam of coal in the carboniferous formation. The deposit almost always contains a large amount of bituminous matter, derived from the fossil plant remains; it is also penetrated throughout by innumerable rootlets (mostly named *Stignaria*), which originally per-



tained to the vegetation now constituting the coal. The latter fact seems to show that the underclays are truly the old surface soils, upon which the carboniferous jungles grew. See COAL.

**UNDERCLIFF**, the name by which a portion of the southern coast of the Isle of Wight is known. It consists of a series of irregular terraces between the cliff proper and the shore, and extends along the coast in the neighbourhood of Ventnor for a distance of about 6 miles. The peculiar configuration has been produced by landslips, the huge masses of chalk and greensand having slipped seawards over the dark blue clay (gault or "blue slipper") which underlies them. There is no historical record of the formation of this surface feature, but a similar undercliff was produced at Axmouth, in Devonshire, by the enormous landslip of 1839.

**UNDERGRADUATE**, a student of a university or college who has not yet taken his first *gradus*, or degree. See UNIVERSITIES.

**UNDERLIE**, a miner's term, denoting the inclination of the plane of a FAULT to the horizon. This slope is also known as the *hade* of the fault.

**UNDERSTANDING**. See INTELLECT and MIND.

**UNDERWRITING**. See SHIPS, LAWS RELATING TO; INSURANCE.

**UNDINE** (Lat. *unda*, a wave), an elementary spirit, supposed by the Kabbalists and the followers of Paracelsus to reside in the waters. So far the idea was simply borrowed from the Naiads of Greek mythology, but on the ancient fiction the Paracelsists embroidered many fanciful details. Thus they taught that Undines could intermarry with men, and that an Undine who became the mother of a human child received with it a human soul. The husband of an Undine was warned never to go abroad on the water with her, or if he did so, to be careful she was not vexed or irritated, as in such a case she immediately returned to her native element; and thenceforth she pursued her husband with changed feelings, even compassing his destruction if he hazarded a second marriage. On this curious myth Baron de la Motte Fouqué founded his beautiful tale of "Undine."

A belief in water spirits still prevails in some parts of Germany; and the Saxon peasants assert that an Undine is a frequent visitor to the market-place of Magdeburg. She wears the dress of a peasant girl, but may always be known by having one corner of her apron wet. The superstition was very widely spread in Northern Europe, the Scandinavians believing in their Nix, and the Scotch in their Kelpies. The reader will not need to be reminded that the White Lady of Avenel, in Scott's novel of "The Monastery," is a water spirit. In the poetry of Germany the *Lurlei* or Loreley, or spirit of the Rhine, plays an important part.

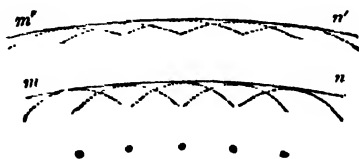
**UNDULATORY THEORY OF LIGHT**, a theory in which it is attempted to refer the phenomena of light to the supposed vibrations of an ethereal medium. Descartes is considered as the first who entertained the opinion that vision might be so explained; but Huyghens ("Tractatus de Lumine") both advanced the undulatory hypothesis and explained by it the principal circumstances relating to the reflection and refraction of light. Elaborated by Euler, and finally worked out in perfect completeness by Thomas Young in 1807, the hypothesis is now adopted by all distinguished mathematicians and physicists.

A straight line which, proceeding from a radiant point, would, in the theory of emission, be called the direction of a ray of light, is, in the undulatory theory, considered as the direction of a wave's motion; and vibrations, very short in extent, of the ethereal particles in any direction about their mean places in such line, but always in planes perpendicular to the direction of the wave's motion, constitute common light. The interval, in that

direction, between two nearest points at which particles, setting out at the same instant from those points, return to the same points after having performed an entire vibration, is called the length,  $l$ , of a wave; and if  $t$  represent the time in which a particle makes a complete vibration,  $\frac{l}{t}$  will denote the velocity of a wave of light, or the velocity of light. No perception of light is supposed to be produced by any vibrations which the particles of ether may make in the direction of the wave's motion. The intensity of light on a screen, or in the eye, is supposed to depend on the greatest extent of the transverse vibrations of the particles when they touch the screen or the retina of the eye, and is represented by the square of that greatest extent of vibration. Plane polarized light is that in which the vibrations of the ethereal particles (still taking place in planes perpendicular to the direction of the wave's motion) are performed, some in lines parallel to one another and to one plane passing through the direction of the wave's motion, and others in lines parallel to one another and to a plane passing through that direction, but perpendicular to the former plane. Thus, if the direction of the wave's motion be perpendicular to this paper, the vibrations both of common and polarized light are performed in planes parallel to the paper; and if the particles vibrate in directions parallel to any line in the paper, the light is said to be polarized in a plane passing through a line in the paper at right angles to that line.

The motions of the ethereal waves in lines radiating from a luminous point being supposed equal, the particles which are in the surface of an imaginary sphere having the luminous point for its centre will be in like positions, or like states of condensation, with respect to those which are within and beyond that surface. As the impulse communicated to the luminous particles continues, the radii of the spherical surfaces (the surfaces of the waves) increase in length, so that if the origin of the light is at a celestial body the surface of the wave at the earth may be considered as a plane.

When the waves from a luminous point arrive at or near any surface which may arrest or change the rate of their progress, every point in such surface is conceived to become the centre whence, as if it were a new luminous point, proceeds another series of concentric spherical waves, the length,  $l$ , remaining the same as before if the ethereal medium is the same. The waves thus proceeding from the different points of an object by which the original wave was arrested interfere with one another; but a plane or curved surface, as  $m n$ , which is a tangent to the surfaces of the



secondary waves at points where the particles are in like state or phases, is to be considered as the front of a wave.

The number of vibrations to or fro which an ethereal particle makes in a given time is supposed to determine the colours of natural bodies; but the velocity is constant, since it depends on the homogeneity and uniform elasticity of the ethereal medium, therefore the separate values of  $l$  and  $t$  differ for different colours. The values which cause the perception of redness are the greatest, and those which produce the violet colour are the least. At the same time the long red waves are slow compared with the quick short violet ones, so that the general velocity of light per second (over 186,000 miles) remains the same for all colours.

In order to explain the manner in which reflection takes place at a plane surface, on the undulatory hypothesis, let the direction of a wave's motion be oblique to the reflecting surface, so that the plane forming the front of the incident wave may meet that surface obliquely. Then the points at which the particles are successively arrested become the centres of spherical waves diverging thence; and these waves moving with the original velocity form a plane touching all their spherical surfaces, which becomes the front of the reflected wave, and makes an angle with the reflecting surface equal to that which is made by the incident wave, but in an opposite direction with respect to a perpendicular drawn from that surface. Consequently the directions of the motions of the incident and reflected waves, which are lines perpendicular to their fronts, make equal angles with the reflecting surface.

The manner in which ordinary refraction at a plane surface takes place on the undulatory hypothesis may be thus explained. Let the plane front of a wave meet the refracting surface obliquely; then the points in which the particles successively arrive there become by the interruption the centres of spherical waves whose particular fronts advance in the refracting medium with velocities equal to one another, but different from that of the incident waves: consequently, a plane touching the fronts of all the refracted waves will make with the refracting surface an angle whose sine is, to that of the angle made by the front of the incident wave with the same surface, in a constant ratio, which is that of the velocities of the waves after and before refraction. Thus, in the same medium, the sine of the angle of incidence is, to that of the angle of refraction, in a constant ratio.

In order that the relation between the sines of incidence and refraction may be conformable to the results of experiment, it is necessary to assume that the velocity of the waves is diminished when they enter a medium more dense than that in which they previously moved; and in this circumstance the undulatory theory is opposed to the theory of emission: for in the latter the velocity of light is supposed to be increased when it passes from any medium into one more dense.

When several undulations coexist, arising from neighbouring sources, they are said to *interfere* with one another; and assuming that the displacement of a particle produced by any number of coexisting undulations may be expressed by the sum of the displacements which the undulations would separately produce, the rules of integration will give the whole amount of the disturbance produced by the interference of any number of waves. When, for example, two waves are equal in length, the greatest amplitudes of vibration may occur at places which are at intervals from one another equal to  $\frac{1}{2}, \frac{3}{2}, \frac{5}{2}$ , &c.; and if the amplitudes are equal, the whole amplitude of vibration will be double that of one particle alone; thus on a screen the light produced by the two undulations will be twice as great as that which would be produced by one. On the other hand, if two equal undulations are transmitted in the same direction, and the one follows the other at an interval equal to  $\frac{1}{2}, \frac{3}{2}, \frac{5}{2}$ , the maximum of amplitude in one will coincide with the minimum in the other, and the effects will be destroyed, or the particles will be at rest, and on a screen darkness will be the result. If the undulations follow at other distances, the destruction of the vibrations will be incomplete, and on the screen the brightness will have some intermediate degree of intensity. See INTERFERENCE, NEWTON'S RING.

It was suggested by Newton to the undulatory theory (he having preferred the corpuscular or emission theory, which made light to consist of actual particles of some unknown and infinitely divided substance) that, if just light passing by the edges of an opaque body ought to be inflected into the shadow cast by the body, as waves of air and water flow round any obstacle which may be in the

direction of their motion. This difficulty has not wholly been removed; but it is well known that such inflections do really take place to a certain extent, and the circumstances attending them have been fully explained by the theory. Dr. Young allowed a diverging pencil of light to pass into a dark room through a very small orifice, and having placed in the pencil a narrow and opaque body with parallel sides, he observed that the shadow which the body cast on a screen was divided by parallel coloured bands alternately dark and bright, the band in the middle being always bright. In order to account for this appearance on the undulatory hypothesis, it is only necessary to observe, that the paths of the waves of light from the edges of the body to a point on the screen opposite its centre being equal to one another, the fronts of the interfering waves must arrive at that centre in the same state; and their effects being added together, there must result a maximum of brightness; but the paths of the waves from the edges of the body to any other part of the shadow on the screen will be unequal; and at every place where the difference is exactly an uneven multiple of  $\frac{1}{2}$ , the waves must arrive in opposite phases, and thus destroy each other's effects, or produce darkness. Between these dark bands the degrees of brightness will depend upon the states of the interfering waves at those places. If the incident light is homogeneous, or of one colour, all the bright bands are of that colour, and the intervals between them are black.

If the orifice is a narrow slit with parallel sides, the image on the screen will be a series of parallel bands alternately dark and bright, and symmetrically disposed on each side of a bright band in the centre. If the orifice is circular, the central image is either a bright or a dark spot, according to the distance of the screen; and about it are concentric coloured rings. See DIFFRACTION OF LIGHT.

The breadths of the bands, and the diameters of the concentric circles of light and darkness, are found to depend on the breadth or diameter of the aperture, and not on the nature of the material by which the diffraction is produced; and Dr. Young considers this circumstance a strong argument against the opinion that the phenomena are, as Newton alleged, the results of attractive and repulsive forces exercised by the edges of the material on the particles of light. But, at the same time, it may be observed that some discrepancies between the results of the undulatory theory and the phenomena of diffraction within the shadows of small circular discs have been pointed out by Professor Potter, of University College, London.

In the undulatory theory it is assumed that common white light is caused by the combined undulations of the ethereal medium, when waves of different lengths are mixed together; and the most serious difficulty to which that theory is subject lies in the imperfect explanation which it affords of the unequal refrangibilities of different colours. Professor Airy suggested that the development of the action caused by the particles of a refracting medium may depend on time, and on that account it may give rise to unequal refrangibilities by producing differences in the velocities with which waves are transmitted through the medium.

**UNFUNDED DEBT** is a part of the national debt of the United Kingdom, which consists of money raised by granting annuities for life or a term of years, and by exchequer bills, which are redeemed from time to time. See EXCHEQUER BILLS.

The following was the exact position of the National Debt on 31st March, 1887:—

Funded Debt, . . . . .	£637,637,610
Terminable Annuities—	
Estimated Capital Value in	81,123,148
3 per cent. Stock at par, .	
Total Unfunded Debt, . . . . .	17,517,900

**UNGUENTS.** See OINTMENTS.

**UNGULATA** (Lat., hoofed) is an order of MAMMALIA, distinguished by having the toes protected by hoofs. This order is generally divided into two suborders, Artiodactyla (even-toed), with two or four toes, and Perissodactyla (odd-toed), with one or three toes. Such a classification is, however, inapplicable to the numerous extinct forms which have been found fossil in Tertiary strata, especially in North America. The latest classification is that of Professor Flower, who divides the order into two groups, *Ungulata vera*, containing the suborders Artiodactyla and Perissodactyla, and *Subungulata*, containing the suborders Hyracoidea (Hyrax), Proboscidea (Elephants), and Amblypoda, the last containing a number of fossil forms, such as Dinoceras, Toxodon, &c.

The Ungulata are eminently terrestrial and herbivorous. The molar teeth are generally massive, and have broad crowns marked with tubercles or ridges on the surface. The canine teeth, when present, are generally in the form of tusks. Clavicles are absent. The toes are provided with blunt, flattened, hoof-like nails. Horns are frequently present, either bony and deciduous, as in the deer and giraffe, or composed of horny tissue, as in the oxen, antelopes, and rhinoceros.

In the old order Ungulata (the *Ungulata vera* of Flower) the functional toes never exceed four. The placenta is non-deciduate, with the villi either evenly scattered over the chorion (*diffuse*) or collected in little tufts on its surface (*cotyledonary*). In the suborder Perissodactyla, the toes are one or three, the middle toe being the largest and sometimes the only functional one. In the tapirs and some fossil forms the toe corresponding to the fifth digit is present on the fore foot, but is small and does not reach the ground. The premolar and molar teeth are in a continuous series, and have massive, square, transversely ridged or complex crowns. The stomach is simple, and the cæcum large and sacculated. This suborder includes the recent families Tapiridae (TAPIR, Plate III., fig. 6), Rhinocerotidae (RHINOCEROS), and Equidae (HORSE, ASS). With these are combined a large number of fossil forms from the Tertiary formations, as Lophiodon and Hyracotherium, allied to the tapirs; Hyracodon, Macrauchenia, allied to the rhinoceros; Eohippus, Hipparion, allied to the horse.

In the suborder Artiodactyla the third and fourth toes are almost equally developed, and the second and fifth are generally present, but are seldom functional. The stomach is more or less complex, and the cæcum is small. The suborder is divided into two sections, Bunodonta or Non-Ruminantia and Selenodonta or Ruminantia. The Bunodonta have the crowns of the molar teeth tuberculated, usually more than one pair of incisors in the upper jaw, and no horns. They are divided into three families, Suidæ (PIG, PIGGARY), Hippopotamidæ (HIPPOPOTAMUS, Plate I., fig. 1), and Anoplotheridæ, the last containing only extinct forms. The RUMINANTS are distinguished by the concentric crowns of their molar teeth, the usual absence of incisor teeth in the upper jaw, and the complex nature of the stomach. They form three tribes, Tylopoda, containing the family Camelidæ (CAMEL, fig. 2); Tragulina, containing the family Tragulidæ (CHEVROTAIN, Plate II., fig. 3); and Pecora or true ruminants, containing the families Camelopardidæ (GIRAFFE, fig. 4), Cervidæ (DEER), Antilopidæ (ANTELOPES, Plate III., fig. 5), Ovidæ (SHEEP and GOATS), and Bovidæ (OXEN).

The group Subungulata contains the suborders HYRACOIDEA, PROBOSCIDEA, and Amblypoda. The suborder Amblypoda is entirely extinct, containing a number of forms from the Tertiary strata, chiefly of North America. In the general proportions of their body and in the structure of their limbs they must have presented considerable resemblance to the elephants. There were five toes on the fore feet, four on the hind feet. The tail was long and

slender, and there was no trunk. The head was long and narrow, with a great crest on the occiput. It is doubtful if horns were present. The brain-case is remarkably small. There were no incisor teeth in the upper jaw, but three small incisors were present on each side of the lower jaw. The upper canines were in the form of a large curved tusk, much smaller in the female. These forms have been described chiefly by Marsh and Leidy. The chief genera are Dinoceras and Uintatherium.

**UNICORN** (Lat. *unus*, one, and *cornu*, a horn; Heb. *re'em*). 1. An animal referred to about ten times in the Bible. The Hebrew term *re'em* is singular, and should not, as in Deuteronomy xxxiii. 17 ("his horns are like the horns of unicorns") in the Authorized Version, have had a plural signification assigned to it. This has been done in the belief that the unicorn of Scripture is identical with the rhinoceros, the only species of which that was well known in the time of James I. being the Indian rhinoceros. Such seemed the view of the Septuagint, which King James's translators followed, only indicating by a marginal note that the Hebrew was "an unicorn" (*i.e.* singular). The phrase refers to Ephraim and Manasseh as the two horns of Joseph, and they are to be "as the two horns of an unicorn," a patent absurdity. The word *re'em* is now almost conclusively shown to be a variety of the Hereyuan Urus or Wild-ox, untamable, and going fiercely with its two long curved horns when attacked. It is familiar as a quarry for the chase on Assyrian bas-reliefs, and Assyrian kings hunted it in Palestine. The Revised Version translates *re'em* properly as wild-ox here ("his horns are like the horns of the wild-ox"), and so also in other passages, for instance, Job xxxix. 9, "Will the wild-ox (Authorized Version, the unicorn) be content to serve thee?" and elsewhere. As for the classical writers, Pliny mentions "Indian oxen with undivided hoofs and a single horn" (Nat. Hist. viii. 21), and Aristotle speaks of "a few solid-hoofed animals with one horn, such as the Indian ass and the oryx" (H. A. ii. 2).

The literature which has gathered around the question, What was the unicorn? would fill several large volumes. Four main types are given:—1. Fabulous animal, used as an emblem; 2, the Oryx; 3, the Rhinoceros; 4, the Buffalo or rather Urus.

2. The name of a fabulous animal used in heraldry. In the royal arms of Britain it is introduced as a supporter, *salient*, having the head, neck, and body of the horse, the legs of the stag, the tail of the lion, and a long twisted horn on the forehead. This heraldic figure may be traced to the accounts of a fabulous animal given by some ancient writers. "The *Onoi agrioi*," says Ktesias (B.C. 400), "are as large as horses, and even larger, with white bodies, red heads, blue eyes, and have each on their foreheads a horn a cubit and a half long, the base of which is white, the upper part red, the middle part black. Drinking-cups are formed of these horns; and those who drink out of them are said to be subject neither to spasm nor epilepsy, nor to the effects of poison." Pliny (A.D. 70) has the same animal in view when he says—"The Orsean Indians hunt a very fierce animal, called the monoceros, which has the body of a horse, the head of a stag, the feet of an elephant, and the tail of a wild boar; it utters a deep lowing noise, and has a single horn, two cubits long, projecting from the middle of its forehead." "The monoceros," says Aelian (130 A.D.), "is as big as a full-grown horse, with a mane and yellow woolly hair, of greatest swiftness, with feet like the elephant, and the tail of a wild boar. It has a black horn growing between the eyebrows, which is not smooth, but with natural twistings, and is very sharp at the point. It utters loud harsh sounds. It lives peaceably with other animals, but quarrels with those of its own kind—the males even destroying the females, excepting at breeding-time, at which season the animals are gre-

garius; but at other times they live in solitude in wild regions." The unicorn was added to the British lion as a supporter of the royal arms by James VI. of Scotland and I. of England. The first Tudor (Henry VII.) had taken the famous English cognizance of the lion, and added to this a rouge dragon, a famous Welsh heraldic beast, to show his Welsh descent. When James and the Stuarts succeeded to the Tudors two unicorns were the supporters of the Scottish royal arms, and to symbolize the union of the Scottish and English crowns one of the unicorns of Scotland replaced the dragon of Wales. Thus it is that the famous lion and unicorn arose.

3. The Sea Unicorn or Narwhal (*Monodon monoceros*), one of the Delphinidae, or Dolphins, in which the male is furnished with a canine tooth of great length, projecting from the centre of the upper jaw, in the form of a straight, spirally twisted pole of ivory.

**UNIFORMITY, ACTS OF.** Parliament, which has never attempted to coerce lawyers into agreement of opinion, or doctors into using one method for the treatment of disease, has, however, made repeated attempts to enforce uniformity of religion. Its records contain a considerable number of Acts of Uniformity. The first of these was passed in the second year of the reign of Edward VI. The 1 Edw. VI. c. 1 states, that "of long time there have been divers forms of common prayer, commonly called the service of the church, that is to say, the use of Sarum, of York, of Bangor, and of Lincoln; and besides the same, now of late much more divers and sundry forms and fashions have been used in the cathedral and parish churches, as well concerning the matins and the even-song, as concerning the Holy Communion, with divers and sundry rites and ceremonies." It proceeds to pronounce a commendation upon the king for his great goodness in having "borne with the frailty and weakness of his subjects in their behalf," and for "abstaining from punishment of those that have offended." And "to the intent that a uniform, quiet, and godly order should be had, the king appointed Cramer, archbishop of Canterbury, with other bishops and learned men (having as well eye and respect to the Scripture as to the usages in the primitive church), who together shall make one convenient and meet order of common and open prayer: the which, at this time, by the aid of the Holy Ghost, with one uniform agreement is of them concluded." This book was to be used in all churches and chapels. Whosoever had before offended was to be pardoned, except such as were in prison in the Tower and in the Fleet. "None other book" was to be used. Any minister who disobeyed the Act was to be deprived of his living or imprisoned for life.

The book which was thus to secure "one uniform agreement" having failed to do so, was called in by authority of the 5 & 6 Edw. VI. c. 1, "because there hath arisen, in the use of the aforesaid common service divers doubts, rather by the curiosity of the ministers and mistakes than of any worthy cause." The same session of Parliament in which the corrected Book of Common Prayer received the sanction of law, had to pass an Act against "fighters and frayers in churches and churchyards," who resisted by violence the first attempt of the State to compel uniformity. The 5 & 6 Edw. VI. c. 4 (now for the most part repealed) provides that whoever was found guilty of quarrelling, chiding, or brawling, in any churchyard, the bishop was to punish in the way therein stated. If the person struck a blow, "or drew any weapon with the intent to strike," one of his ears was to be cut off; and if the offender "have none ears," then "he or they shall be burned and marked in the cheek with a hot iron." Another Act of Uniformity changed the whole state of things. Queen Mary's Parliament swept away all the Acts of Edward relating to bishops and the liturgy. By the 1 Mary, c. 2, it was provided that "all such divine service and administration of sacra-

ments as were most commonly used in England in the last year of Henry VIII., shall be used through the realm after the 20th December, 1553."

In five years and a half (1558) Elizabeth required the restoration of Protestant uniformity. The 1 Eliz. c. 2 made void the repealing statute of Mary because it occasioned "the great decay of the due honour of God, and discomfort to the professors of the truth of Christ's religion." The reigns of Edward, Mary, and Elizabeth contain many statutes of pains and penalties to coerce the clergy into external oneness, to which we need not refer. (Muscott on the "Church Laws.")

During the Commonwealth the laws against Protestants, whereby they were prohibited from writing, preaching, or printing anything against the then established religion, under heavy penalties, were repealed. At the Restoration they revived, and were systematically and rigorously enforced. The 13 Car. II. s. 2, c. 1, commonly called the Corporation Act (since repealed), provided that no person should thereafter be elected to office in any corporate town, who should not within one year previously have taken the sacrament of the Lord's Supper according to the rites of the Church of England; and every person so elected was also required to take—in addition to a certain oath and declaration afterwards repealed by the 5 Geo. I. c. 6, s. 2—the oaths of allegiance and supremacy. This was followed by the 13 & 14 Car. II. c. 4, which, to distinguish it from the less effectual enactments which have been made with the same object, is commonly emphasized as *The Act of Uniformity*. It was introduced under the following circumstances:—A royal commission, composed of Episcopal and Presbyterian divines, appointed in 1661 to consider what alterations could be made in the Book of Common Prayer to meet the objections of the non-conformists, who had endeavoured to induce the king not to revive its use, having held a conference which ended without any agreement being arrived at, the king directed the Convocation to proceed at once with the revision of the liturgy. The two Houses of Convocation worked with great zeal and despatch, and the result of their labours having received the approval of the king and Privy Council (February 24, 1662), they were transmitted to the House of Lords, who minutely discussed the alterations and amendments, and after giving them their sanction sent the revised book to the House of Commons. The Commons being well pleased with it, determined that it should be used by the entire country. To give effect to this their determination they introduced the Act of Uniformity. It passed both houses on the 9th July, 1662, and is the 13 & 14 Car. II. c. 4, above referred to.

The passing of the Act of Uniformity caused 2000 clergymen of the Church of England to secede. They sacrificed their emoluments entirely, and joined the ranks of the Presbyterians and Independents. For a further account of this event and its results, see under CONGREGATIONALISM and NONCONFORMITY.

An Act "for the amendment of the Act of Uniformity" was passed in 1872, providing chiefly for shortened services and deciding the interpretation to be put upon certain rubrics and orders. The Act for the Abolition of University Tests, passed in 1871, had already repealed several sections of the Act of Uniformity so far as they excluded nonconformists from the universities of Oxford and Cambridge.

**UNIGENITUS, BULL OF**, a celebrated constitution promulgated by Pope Clement XI., in 1713, in condemnation of the so-called heretical tenets of Jansenism, as set forth in the "*Réflexions Morales sur le Nouveau Testament*," by Père Quesnel. The bull obtained its distinctive appellation, as usual, from its first words, "*Unigenitus Dei Filius*." It was procured through the influence of Letellier and the Jesuits, and formally condemned "in

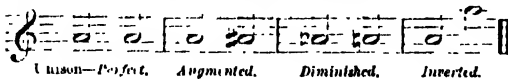
a lump" (*in globo*), as "false," "scandalous," and "offensive," 101 propositions selected from Quesnel's work. A large party in the French Church, headed by Cardinal de Noailles, archbishop of Paris, refused to accept it, and appealed against the Pope to a general council. This opposition was continued till 1730, when the bull was registered by the parlement of Paris, and De Noailles forced to submit.

**UNION, ACTS OF.** The union of the crowns of England and Scotland took place at the accession of James VI. of Scotland to the English throne in 1603. The beginning of the next century saw the legislative union of the two kingdoms as Great Britain in 1707. The beginning of the next century again saw the legislative union of Ireland with Great Britain in 1801, the crowns having never been separate from the first Irish conquest of Henry II. in the twelfth century. See the articles SCOTLAND and IRELAND, section *History*.

**UNION JACK**, the national banner of the United Kingdom, in which the crosses of St. George, St. Andrew, and St. Patrick are blended, to denote the union of the three kingdoms of England, Scotland, and Ireland. The banner of St. George, a red cross on a white ground, was the favourite Tudor flag; Henry VII. won with it at Bosworth. To this James I. on his accession added the banner of St. Andrew, a white cross on a blue ground, saltire (*i.e.* X fashion); hence it is said sometimes that the flag gets its famous name from *Jacques* (James). This is, however, absurd. The third banner was not incorporated till 1801. Then was added the banner of St. Patrick to represent Ireland, a red cross saltire, on a white ground. The white edge to the St. George's cross shows its white ground, the narrow white border of the saltire cross shows the white ground of Ireland, the broad white edge the cross of Scotland; the flag is completed by triangular spaces of blue, the ground of Scotland. See the illustration in the Plate FLAG. The term *Jack* (Ital. *giacco*, Span. *jaco*) means coat, especially coat of mail, and hence a "coat-of-arms;" our word "jacket" is its diminutive. The Union Jack was therefore the Union coat-of-arms, and as such was an appropriate term even before the Union with Ireland.

**UNIONS, TRADES.** See TRADE SOCIETIES.

**UNISON** (Lat. *unus*, one, and *sonus*, a sound), in music, is properly speaking a sound which is exactly the same as another in regard to pitch or rate of vibration. It is, however, found convenient in musical composition to regard a unison as an interval like any other; and as such it is subject to augmentation, diminution, and inversion, in the latter case becoming an octave.



Unison—Perfect, Augmented, Diminished, Inverted.

**UNIT** or **UNITY**, the name given to that magnitude which is to be considered or reckoned as one when other magnitudes of the same kind are to be measured. It is not itself *one*, but is the magnitude which *one* or 1 shall stand for in calculation: it is a length, or a weight, or a time, as the case may be, and may be of any numerical or fractional value whatever, while 1 is only a numerical symbol. This symbol 1 represents the abstract conception of singleness, as distinguished from multitude, and is the unit of abstract arithmetic; but all concrete quantities must have units of their own kind.

**UNIT OF ACCOUNT.** Accounts must be kept by some recognized standard unit. Thus, in England, the unit being the pound sterling, all accounts are kept in pounds and parts of pounds; and in France, the unit being the franc, accounts are kept in francs and decimals of francs. But while in England the unit of account is an actual gold

coin, the unit of France is only a theoretical one, unrepresented except by silver tokens, or by gold multiples of five francs and upwards. In Canada the unit of account is the dollar, but it is represented by a bank-note, and not by any coin. Still more unusual is the Old English unit of account, the shilling, or twentieth part of a pound troy of silver; for this was not represented at all until as late as Henry VII., when the first coin of the value was struck.

**UNIT OF VALUE.** Were it possible to find one substance which should always exchange for a certain quantity of a second substance, and another certain quantity of a third substance, &c., we should have a perfect unit of value. This, however, is not possible. If we take corn, then in an abundant wheat year more wheat would be given for other commodities than in a scarce year, and *vice versa*. It becomes therefore very difficult to estimate wealth at different places and times. Thus, in the present day, a cod weighing 16 lbs. is often bought in Cornwall for a shilling, though that would buy but a pound or a pound and a half in London; or in mediæval times as many pence would buy meat as shillings would now be required. Even if we take gold, a very stable commodity, as our unit, this, as the example just given shows, is very uncertain. Such as it is, however, it is the best unit we can as yet find, and though by its accumulation (as it is very durable, and continued discoveries add largely to the stock in hand), it falls in value as time goes on, and causes prices (*i.e.* values of other things measured in gold) to rise in like proportion, it does so at a tolerably even rate. Further, the older states grow the more gold they possess, and the less difference does a sudden increment produce in prices; thus gold tends to increase in stability.

**UNITARIANISM.** This word, in its strict and literal interpretation, denotes simply a belief in one God, and when thus understood is a generic term applicable to all Christians—the unity of the Divine nature being an essential doctrine of Christianity—to Jews, to Mohammedans, and also to those persons, generally termed Theists, who, on grounds supplied by reason alone, believe in the existence, providence, and moral government of one Supreme Being. It is but seldom, however, that the term is used with this significance, and in the general way it is used and accepted as the name of these Christians who reject the doctrine of the Trinity, and who assert that it is incompatible with the doctrine of the unity of the Divine nature.

The period at which Unitarianism originated is uncertain, inasmuch as the defenders of the system strenuously assert that their belief is simply a return to the teaching of Jesus and the apostles, and the belief of the Christian Church during the first century at least of its existence, while Trinitarians, for the most part, consider the doctrine of the Trinity to be the primitive doctrine of the Church, and regard all deviations from it as heresies of later date. However this may be, it is certain that discussions concerning the nature of Christ arose simultaneously with the earliest speculations concerning the Logos, and that as early as the middle of the second century there existed a party in the Church which upheld the doctrine of the undivided unity, or, as it was then termed, the "Monarchy" of God. Of the leaders of this party the names have come down to us of Praxeas, against whom there is a treatise by Tertullian; Theodotus, a leatherseller of Byzantium; Artemon of Rome; Beryllus, bishop of Bostra in Arabia; Noetus of Smyrna; and, above all, Paul of Samosata, bishop of Antioch, who was eventually deposed from his office on account of his opinions. The chief point in the teachings of the "Monarchians" seems to have been their doctrine of a single rule or government of the universe, and according to Tertullian they were a numerous party in his day. In the third century SABELLIUS defended the theory of the Godhead called after his name, Sabellianism, and in the fourth century the church was rent asunder by the great Arian controversy.

In the end the Trinitarian doctrine obtained the ascendancy, and became the accepted creed of the church, and though there seems always to have been a few who inclined towards Arianism, it was not until that great ferment of thought which produced the revival of letters and the Reformation appeared that the doctrine of the Trinity was denied by any large body of Christians. With the Reformation, however, Unitarianism quickly appeared, under the name of Socinianism [see *SOCIANS*], and in a short time it gained many adherents. But while Roman Catholics and Protestants were divided upon many important points, they were united as to the necessity of suppressing Unitarianism, and the martyrdom of Servetus, who was burned at Geneva in 1553 for the profession of its doctrines, still remains the darkest blot on the character of John Calvin. In 1563 Bernardino Ochino published in Zurich his dialogues discussing the doctrine of the Trinity, while anti-Trinitarian doctrines were taught about the same time at Geneva by Matteo Gribaldi and Giorgio Blaudrata. A few years later we read of Giovanni Valentino Gentilio, who for holding Servetist doctrines was beheaded at Bern. In 1577 Faustus Socinus proclaimed at Basel that the Trinity was a Pagan doctrine, and soon afterwards, with his followers, he sought refuge in Poland. In that country the Socinians soon became a powerful sect, their tenets being espoused by many of the nobles, and they continued to flourish until the reign of John Casimir, by whom they were almost broken up and destroyed. A few managed to hold their ground in Transylvania, and here they have continued down to the present time, counting now over 100 congregations and upwards of 50,000 members. In England there are traces of Unitarianism coeval with the Reformation. In the time of Edward VI. George Van Paris, for denying the divinity of Christ, was burned at Smithfield, as was Francis Wright at Norwich in 1588, and Bartholomew Lee at Smithfield and Edward Wightman in Lichfield in 1612. The first religious society founded in England wholly on the principle of Unitarianism was gathered in the time of the Commonwealth by John Biddle, who on this account, and because of his various publications in defence of the doctrine, is generally styled "the father of English Unitarianism." In 1640 the synods of London and York directed a special canon against Socinianism, and in 1652 the *Barrovia Catechism* was publicly burned in London; but three years later we find Dr. Owen declaring, in reference to Unitarianism, "that there is not a city, a town, scarce a village in England wherein some of this poison is not poured forth." Before the close of the seventeenth century the Unitarians had established places of worship in London, and many eminent men of the period were avowed Arians or Unitarians, among these being Milton, Locke, and Newton, and a little later the learned apologist, Dr. Laidner. During the eighteenth century Arianism was defended in England by many learned and able writers, including Berry, Whitson, Samuel Clarke, Whitby, Emlyn, Priestley, and Becham, and in 1771 an epoch in the history of English Unitarianism was marked by the resignation of Dr. Lindsey of his charge in the Church of England, and his acceptance of the pastorate of the Unitarian congregation of Essex Street, London. During this period, also, many of the independent churches founded by the clergy expelled from the Established Church by the Act of Uniformity had gradually embraced Arian doctrine, so that the Unitarians of the present day are direct descendants and representatives of that branch of the Nonconformists who received the denomination of Presbyterians, though no Presbyterian form of church government, properly so called, has ever existed among them or their predecessors. In America, from the first settlement of the New England colonies, there were modifications of Puritan doctrine, which assumed the phases of moderate Calvinism, Arminianism, and Arianism; but it was not

until after the republication in Boston of Emlyn's "Humble Inquiry into the Scripture Account of Jesus Christ," that Unitarianism appears as a sect in the New World. Once established it made steady progress, and at the commencement of the present century a controversy between Dr. Channing and Dr. Worcester resulted in the separation of the Unitarians from the Congregationalists, the ministers of a large number of the Congregational churches of Boston and vicinity and throughout the state joining the movement and registering themselves as Unitarians. Harvard College was in their hands, and still remains so.

At the present day the Unitarians of England and America, in the proper sense of the word, are all Congregationalists, inasmuch as every society is a distinct religious community, acknowledging no external earthly control in spiritual concerns, but they have a bond of union in England in the British and Foreign Unitarian Association, which was founded in London in 1825, and which has ever since regularly held its anniversaries in that city. Its efforts are directed to the dissemination of Unitarian books and tracts, to limited missionary efforts, to philanthropic labours, and the help of feeble Unitarian Societies. In 1825, also, an American Unitarian Association was organized in Boston, its general purposes being similar to those of the British and Foreign Association. In England the Unitarians rank among the first of the minor religious bodies, and the ability and learning displayed by their leading ministers give them a great influence in the country. They have an extensive Sunday-school Association, and they maintain and control the unsectarian educational establishment, Manchester New College, which was removed from Manchester and established in London in 1857. The Memorial Hall was, in 1865, erected for a separate Unitarian College in the city of Manchester, and students from the Unitarian denomination are admitted to the Presbyterian College at Carnarthen, Wales. The Transylvanian Unitarians are the only members of that persuasion who are governed by an ecclesiastical council and a bishop. They have a great Unitarian College at Klausenburg, besides other institutions. It would be wrong, however, to estimate the influence of Unitarianism by the number of its professed adherents, for its influence extends in many directions where its name is not accepted or professed. In the United States the *UNIVERSALISTS* are for the most part upholders of Unitarian doctrine; a large majority of the Quakers, known after their founder as the "Hickite Quakers," hold anti-trinitarian views, and Unitarianism is also the doctrinal system of a numerous denomination there who call themselves "Christians" by way of distinction, and refuse to recognize any other appellation. In England the leaders of the Broad Church party hold doctrines very little removed from Unitarianism, and the system is also making great advances among the Congregational and Baptist churches. On the Continent most of the so-called "Liberal Christians" are Unitarians.

With respect to the doctrines of Unitarianism, it must not be supposed that Unitarians have any definite or formulated system of theology, or any creed or catechism to which general assent is given. As a matter of fact there are almost as many differences of opinion to be found among Unitarians as among Trinitarian writers. All, however, are agreed in rejecting the dogma of the Trinity in its varying phases of a threefold or tripersonal deity, whether three in substance or only in name and form, and in maintaining the essential unity of God as Creator and Father of created nature, and the subordinate rank of Jesus Christ. Within the range of this, however, opinions about Jesus vary from those that assign him a pre-existent and superangelic rank to an estimate purely human. Few at the present day regard with more than historical interest the teachings of Sabellius, Paul of Samosata, and Arius, or of the later leaders, Servetus and the Socini, the doc-



trines of whom, sharing, as of necessity they did, in the crudities of contemporaneous thought, have largely passed away. The early English Arians and their successors of the preceding century accepted, for the most part, much of the supernatural element of Christianity and the inspiration of the Scriptures, basing their arguments on the Bible declarations of the unity of God, and the facts of ecclesiastical history having reference to the formulation of the doctrine of the Trinity. At the present day many of the Unitarians of the conservative school of thought believe in miracles, in the inspiration of the Scriptures, and in the resurrection of Christ, but they form only a small and rapidly decreasing element in the system. Pledged to free inquiry as they are, the Unitarian churches have been the first to accept the results arrived at by the critical scholars of Germany in reference to the composition and nature of the books of the Bible, and concerning the foundation and subsequent history of the Christian Church. Thus the majority of modern Unitarians hold a purely rationalistic creed, and consider that reason and conscience must be the ultimate court of appeal on all questions of religion and morality. They reject entirely the miraculous and supernatural element in Christianity, accepting Christ only as the human son of Joseph and Mary, although they assign him the highest place as the religious teacher, example, and leader of men. It follows of necessity that they reject also all claim to supernatural authority or inspiration upon the part of the church, and while they use the Bible as a religious text-book, and consider it contains some of the most profound and permanent of the truths of religion, they regard it as fallible, imperfect, and in some matters positively incorrect and misleading. At the same time they cling to the title of Christians, and, as we have before mentioned, maintain that their faith is essentially the same as that of the early church as taught by Jesus and his disciples.

See Lange, "Geschichte und Lehrbegriff der Unitarier vor der Nicänisch Synode" (Leipzig, 1831); Meier, "Die Lehre von der Trinität" (Hamburg and Gotha, 1841); Beard's "Unitarianism Exhibited" (London, 1860); Ellis' "Half Century of Unitarianism" (London, 1860); and Orr's "Unitarianism in the Present Time" (Boston, 1863). See also the articles under ARTS and TRINITY, and for biographical notices of some of the more eminent modern Unitarians, under CHANNING, PARKER, and MARTINEAU.

**UNITE**, a gold piece coined by James I., and after him by Charles I., to replace the sovereign, when this rose in value from 20s. to 30s. James's sovereign was marked with the figures 30 for its new value; and the unite bore the value of 20s. The name was given it because James meant it as the first piece of a union coinage to pass current in both Scotland and England. The type was at first a half figure holding sword and orb; but afterwards a laureate bust, whence the popular name of the coin, the *laurel*.

**UNITED BRETHREN IN CHRIST** is the name taken by a German Protestant Church which arose about 1760 among the Germans settled in Pennsylvania. Its founders were Philip William Otterbein, a missionary of the German Reformed Church, who had been sent out to America by the Synod of Holland, and Martin Boehm, a Mennonite preacher, the first members being drawn from the more fervent members of the Lutheran, Reformed, Mennonites, Tunkers, Amish, and Moravian churches. The first societies were ministered to by Otterbein and Boehm, and as the calls for preaching became numerous, laymen selected from the converts were licensed to preach. After a time these labourers met in annual conferences to settle the details of the work, and to examine and appoint ministers, the first of these meetings being held in 1800, and the first general conference in 1815. At the present

day, the Brethren, who have steadily increased in numbers, have ten colleges, an extensive publishing office, over 4000 organized churches, 2000 ministers, and 150,000 members. They are Arminian in theology, and supply their churches with preaching on the itinerant plan. They have quarterly, annual, and general conferences, the latter representing the highest ecclesiastical authority, and meeting every four years. Until 1873 the latter consisted exclusively of clerical delegates, but in that year it adopted the principle of lay delegation, and the church ratified it when it was submitted to a general vote. It elects bishops for a term of four years, and assigns them each a district. The discipline of the Brethren is strict, no person being admitted a member who has not "experienced a change of heart," and no adhering member of any secret society, or man, facturer, seller, or drinker of intoxicating liquors, can be a member of the church. Before the Civil War they were most outspoken in their opposition to slavery, and they excluded slave-holders from their communion. Baptism is administered by them by the methods of sprinkling, pouring, or immersion, each member being permitted to exercise his own judgment in regard to the mode, infants being baptized when it is desired. Open communion is practised, and foreign missions in Africa and Germany have been established.

**UNITED EVANGELICAL CHURCH** is the name adopted by an ecclesiastical denomination in Germany, which arose in 1817 out of a union of the Lutheran and Reformed Churches. Attempts at uniting these two churches were made as early as 1529, when leading theologians of both schools held a conference at Marburg. These attempts were often renewed, and the efforts of the unionists received on more than one occasion royal encouragement and support; but it was not until 1817, after the celebration of the tercentenary of the Reformation, that any practical establishment of the union became possible. The leadership in this movement was assumed, and has ever since been maintained, by the government of Prussia, but the example of Prussia was followed by other German states. Thus the union was introduced either by resolution of synods or by a general vote, in Nassau in 1817, the Bavarian Palatinate in 1818, Baden in 1821, and even in Wittenberg in 1827, where the Reformed Church had hardly an existence. Saxony, the bulk of Bavaria proper, Mecklenburg, Brunswick, and several other states were too exclusively Lutheran, and Switzerland was too exclusively Reformed to fall in with the movement.

A radical change in the constitution of the church began in 1871, when the state government, in accordance with the laws passed in 1873, substituted the principle of ecclesiastical self-government for that of the consistorial administration heretofore exercised by the state. Church councils were elected in all congregations, and circuit synods, consisting of delegates of the congregations, were convoked. The Prussian government has ever made the utmost exertions to render it possible for the different sections of the National Church to live peacefully side by side; but many of the stricter Lutherans have refused to be united to the Reformers, and have established an independent church for the maintenance of their principles. See also under LUTHERANS.

**UNITED PRESBYTERIAN CHURCH.** This religious body, the third in size among the Presbyterian Churches of Scotland, is composed of two denominations, the United Secession and the Relief Churches, which were formed into one in 1817. The United Secession Church originated in 1733, its principal founder being Ebenezer Erskine, minister of Stirling, whose talents, learning, and piety had obtained for him great influence in the church and the country. For many years previous to this date, two parties had existed in the Established Church of Scotland, the "court" or "moderate" party, who held very

latitudinarian opinions both as to discipline and doctrine, and a small number of earnest evangelicals, who held strong views upon both points. The law of patronage, restored in 1712 under Queen Anne, by which the nominees of patrons were inducted into benefices contrary to the wishes of the people, caused much irritation among the earnest and devout members of the church, who considered such proceedings as wholly destructive to ecclesiastical discipline; and further offence was given, when, in 1720, a very popular evangelical work entitled the "Marrow of Modern Divinity," was condemned by the Assembly. Twelve ministers, known afterwards as the "Marrow-men," protested against the decision of the Assembly, and the controversy thus begun continued to smoulder and burn until matters reached a climax in 1732-33. During the interval many high-handed settlements of ministers had been effected, the petitions of the congregations being treated with contempt by the Assembly; and finally, in 1730, this body enacted that in future no reasons of dissent against the determinations of church judicatures should be recorded. This arbitrary act was very strongly resented by the leading evangelical ministers, and on 10th October, 1732, the Rev. Ebenezer Erskine, then moderator of the Synod of Perth and Stirling, preached a sermon before the synod, remonstrating against these violations of the constitution of the church and of the rights of the people. For his statements on this occasion he was censured by the synod, and on appeal the sentence was affirmed by the General Assembly in May, 1733. Mr. Erskine presented a written protest against this decision, to which three other ministers, William Wilson of Perth, Alexander Moncrieff of Abernethy, and James Fisher of Kinclaven, gave their adherence. This document gave great offence to the court, and after a fierce and tumultuous discussion the four clergymen were ordered to retract their protest, under the penalty of suspension, or even deposition from their office. As they refused to comply with this demand, they were suspended by the commission of Assembly, in August, from the exercise of their office, and deposed in November, and their churches declared vacant. When this arbitrary decision was intimated to them, the four clergymen protested against it as illegal and invalid, declared that they still adhered to the original principles of the Church of Scotland, though they were now compelled "to make a secession from the prevailing party in the ecclesiastical courts," and they concluded their dignified protest by an appeal to "the first free, faithful, and reforming General Assembly of the Church of Scotland." A few weeks later (5th December, 1733), they formally constituted themselves into a presbytery.

The harsh and unjust treatment of these zealous and faithful ministers excited great agitation throughout the country. The dominant party in the church felt that they had gone too fast and too far, and perceived that some concessions must be made in order to allay the popular indignation which their measures had excited. Accordingly, at the meeting of Assembly in 1734, some of the more obnoxious and arbitrary of the recent enactments were repealed, and the Synod of Perth and Stirling was authorized to restore the ejected ministers to their respective charges. They refused, however, to return to the bosom of the church from which they had been expelled, alleging that they had no security against a repetition of the unconstitutional and sinful acts against which they had testified, and no evidence that the course of defection was in reality abandoned. They took their stand at once upon the original constitution and principles of the Scottish Church, and thus put an impassable gulf between them and the men who now guided its councils and decisions. In 1737 the seceders were joined by Ralph Erskine of Dunfermline, brother of Ebenezer Erskine, and three other ministers, and they appointed Mr. Wilson of Perth, a

clergyman of great ability and learning, professor of divinity, to educate candidates for the ministry, and adopted various other measures for extending and perpetuating the secession. In 1739 the eight clerical ministers of the Associate Presbytery were summoned to appear before the General Assembly. They obeyed the summons, appearing before the court as a constituted presbytery, and formally declined the Assembly's authority. In the following year they were all deposed and ejected from their churches.

The loss of their position and emoluments as ministers of the Established Church in no degree diminished the influence and popularity of the seceders. They rapidly "grew and multiplied." The presbytery speedily expanded into a synod, which in 1745 consisted of forty-six churches, and new accessions were made to their ranks from all quarters of the country. Their progress, however, was greatly impeded by a controversy among themselves respecting the religious clause in the oath taken by burgesses in Edinburgh, Glasgow, and Perth, which the one party insisted was inconsistent with the Secession Testimony, and the other wished to make a matter of forbearance. After several long and stormy discussions, an entire separation took place in April, 1747, between the contending parties, and they formed themselves into two distinct bodies, popularly termed 'Burghers' and 'Antiburghers.'

Meanwhile cases of violent settlements of ministers increased throughout the country, and out of the contests which these proceedings caused in the church courts originated another secession from the Established Church. In 1752 the General Assembly peremptorily ordered the presbytery of Dunfermline to induct an unpopular presantee to the church and parish of Inverkeithing, and enjoined all the members of the presbytery to attend on the occasion. Six ministers who were absent from conscientious scruples were brought to the bar of the Assembly; three of them were visited with minor penalties, and a fourth, Thomas Gillespie, minister of the parish of Carnock, was deposed on the spot. This tyrannical and utterly indefensible proceeding led to the formation of a second body, now included in the United Presbyterian Church, viz., the "Synod of Relief," of which Mr. Gillespie, Mr. Boston, a son of the celebrated Thomas Boston of Ettrick, and a Mr. Collier were the founders.

The seceders steadily increased in numbers, and not only erected congregations in all districts of Lowland Scotland, but sent preachers to England, Ireland, and even to America. The tranquillity both of the Burgher and the Antiburgher churches was disturbed towards the close of the eighteenth century by a discussion respecting the power of the civil magistrate in matters of religion, which ultimately led, thirty years later, to the celebrated "voluntary controversy," whose influence upon the religious condition of Scotland has been most momentous. In 1820 the Burghers and Antiburghers were united into one body, termed the United Secession Church, and in 1847 a junction took place between that church and the Synod of Relief, under the designation of the United Presbyterian Church. It has the same standards, the same Confession of Faith and Catechism, and the same form of government, ritual, and worship as the Established Church. But its ministers are supported by the voluntary contributions of the people, and all the office-bearers are elected by the members, male and female.

Candidates for the ministry in this church must attend at least four sessions at one of the national universities, and three sessions at the Divinity Hall, which consists of five chairs of theology, and was, in 1886-87, attended by 108 regular students, and eight students from other churches. In June, 1876, ninety-eight congregations south of the Tweed united with the English Presbyterian Church, reducing to that extent the number of those connected with the body, as well as affecting the amount of



income. There are thirty-two presbyteries and 564 congregations connected with the United Presbyterian Church. The membership amounts to 182,063, the average attendance in the churches to 200,000, the number of elders to 4977, and the annual baptisms to 9894. The number of Sabbath-school teachers is 11,994, and of scholars 97,535; besides 30,535 taught in Bible classes. The income of the church amounted in 1886 to £373,544 14s 1d. The entire income for the ten years ending 31st December, 1886, amounted to £3,756,603. The stipends of the ministers vary generally from £200 to £1000 a year, though a few are still under £200. In nearly all the country congregations a manse is also provided.

There are a considerable number of missionary congregations supported by the United Presbyterian Church in Spain, Jamaica, Trinidad, Old Calabar, Caffraria, India, China, and Japan.

**UNITED STATES OF AMERICA**, a federal republic occupying more than half of the temperate zone in North America, lies between 21° 30' and 49° N. lat. and between 66° 50' and 124° 30' W. lon. The territory is bounded on the N. by British America, from which it is partly separated by the Lakes Superior, Huron, St. Clair, Erie, and Ontario, and by the river St. Lawrence; E. and N.E. by the British province of New Brunswick and by the Atlantic Ocean; S. by the Gulf of Mexico and the Mexican Republic, from which it is partly separated by the Rio Grande del Norte; and on the W. by the Pacific Ocean: the whole forming a parallelogram of 2400 miles in mean length from E. to W., and of 1300 miles in average breadth from N. to S. The extreme length, however, is nearly 2700 miles, and its greatest breadth about 1600 miles, thus presenting a frontier line exceeding 10,000 miles. The area of the United States has been more than doubled since the formation of the confederacy, by the purchases from France, in 1803, of the territory of Louisiana, and of Florida from Spain, 1819; the annexation of Texas in 1846; the conquest of California and New Mexico in 1848; and the purchase of a portion of northern Mexico in 1854. The whole forms an area, according to the estimate made by the Topographical Bureau at Washington, of 2,900,163 square miles. In addition to this vast territory in the centre of North America, the United States in 1867 purchased from the Russian government the north-west corner of the continent, formerly known as Russian America, and now called Alaska. This acquisition, which is bounded inland by the 141st parallel of west longitude, and includes a strip of maritime territory extending southward to the border of British Columbia, has an area of nearly 600,000 square miles; but the interior is subject to the severest cold, and is valuable chiefly for the supplies of skins, which are obtained in large numbers. On the coast, however, especially in the southern part of the territory, the climate is not so severe, and many Americans have settled there.

*Face of the Country.*—In an extent of country reaching from the Atlantic to the Pacific, and through 24 degrees of latitude, as might be expected, every variety of surface—mountain, plain, and valley—is found. Topographically considered, the United States are divided by the Alleghany Mountains in the east and the Rocky Mountains in the west, into three grand sections: 1, the Atlantic or Alleghany Slope; 2, the Pacific or Rocky Mountain Slope; and 3, the Mississippi Valley. The first, lying between the Alleghany range and the Atlantic Ocean, commences in the eastern part of Maine, and extends (with a breadth varying from 80 to about 300 miles) to Alabama. This region, near the sea, is generally bordered by a belt of alluvial sand, and, where uncultivated, is usually covered with a growth of pine and cedar. Farther inland the country becomes hilly, and gradually merges into the Appalachian chain of mountains. The rivers of this

section mostly run in a south or south-easterly direction, with lengths varying from 100 to 600 miles, and are ascended by the tide to the hilly country, a distance of from 50 to 150 miles, to which point they are generally navigated by the smaller ocean craft and steamboats. The second section includes all the country lying west of the Rocky Mountains, and between them and the Pacific, occupying a tract varying from 600 to 1000 miles in breadth, intersected by several mountain ranges of great elevation. The third and largest section, called the Mississippi Valley, comprises that vast region lying between the Alleghany Mountains on the east and the Rocky Mountains on the west, extending through 18 degrees of latitude, with a breadth of from about 800 to 1600 miles. A high table-land terminates this valley on the north. From its most elevated points, about 1900 feet, or an average of 1450 feet above the sea, the streams descend towards every point of the compass, some seeking the ocean through Hudson Bay and the great lakes, and others through the Missouri and Mississippi rivers and the Gulf of Mexico. This plateau covers Minnesota and parts of Wisconsin, Nebraska, and Iowa. The middle sections of the State of Ohio have an elevation of 1000 feet above the Gulf of Mexico. Outlying ridges of the Alleghany chain extend into Eastern Kentucky and Tennessee. The western slope of the valley ascends by an almost imperceptible rise to the height of 7500 feet, forming the elevated base of the more rugged prominences of the Rocky Mountains. A low range, or rather belt, called the Ozark Mountains, traverses portions of the Indian territory, Arkansas, and Missouri, and extends even into Wisconsin. Another low range, called the Black Hills, runs through the eastern and southern parts of the territory of Nebraska, forming the dividing ridge between the head-waters of the Missouri and its great tributary the Yellowstone. The country adjacent to the shores of the Mississippi, below the mouth of the Ohio, is mostly low and level, and a large portion of it is overflowed on every great rise of that river. Immediately adjoining the Gulf of Mexico it is one great marsh. The prairie region, which stretches nearly from the right bank of the basins of the Mississippi and the Missouri to the Rocky Mountains, is of immense extent, but it is not, as is generally supposed, uniformly level. Its surface, on the contrary, is often rolling and billowy, sometimes swelling into very considerable heights. It is covered with long rank grass, being interspersed in Texas with clumps of magnolia, tulip, and cotton trees, and in the northern states with oak and black walnut. The prairies gradually diminish in beauty and verdure as they stretch towards the west, and become more elevated, till at length they imperceptibly unite with, and lose themselves in, the desert zone skirting the foot of the Rocky Mountains.

*Gulfs, Bays, Rivers, and Lakes.*—In our articles on the different states we have so fully described the great waters of the United States that we shall confine ourselves here to such as have a national importance. Perhaps no portion of the globe is more favoured with facilities for navigation, both external and internal. Washed on the east by the Atlantic, on the south by the Gulf of Mexico, on the west by the Pacific, and on the north by the great lakes Superior, Michigan, Huron, Erie, and Ontario, it presents, according to the report of the officers of the Coast Survey and Topographical Department, 12,609 miles of shore line, exclusive of bays, sounds, islands, and lakes; of which 6861 are on the Atlantic, 2281 on the Pacific, 3167 on the Gulf, besides 3620 miles of shore line on the northern lakes (including bays, sounds, and islands), and 49,065 miles of river shore line (including both banks), to the head of navigation in the interior, or to the head of tide in coast rivers.

The most important bays on the Atlantic coast are Massachusetts, Cape Cod, Buzzard, Raritan, Delaware, and

Chesapeake; and on the Pacific, the Bay of San Francisco and the Straits of Juan de Fuca, leading into Puget's Sound, and having one of the best harbours in the world. Long Island, Albemarle, and Pamlico Sounds, varying from 60 to 120 miles in length, are all on the Atlantic coast, the first washing the shores of Connecticut, and the last two those of North Carolina.

The interior of the United States is drained by some of the grandest rivers on the globe. Almost exactly through its middle, from the summit of the great table-land of Minnesota, runs the Mississippi for 3000 miles, like the trunk of a great tree, with its roots in the Gulf of Mexico, and its branches extending east to the Alleghanies and westward to the Rocky Mountains, receiving the tribute of perhaps 100 important affluents, some of them, such as the Missouri, Arkansas, and Red Rivers from the west, and the Ohio from the east, streams of the first class in point of magnitude and the volume of water rolling down their channels. These rivers are severally, in the order named, about 2900, 2000, 2000, and 1000 miles in length, while many of the secondary tributaries have courses of from 300 to 1000 miles. The country drained by the Mississippi reaches from Western New York and Pennsylvania on the east, to the summits of the Rocky Mountains on the west, and from the forty-ninth parallel of latitude to the Gulf of Mexico. The rivers of the Alleghany slope of the most importance are, beginning in Maine, the Penobscot, Kennebec, Connecticut, Hudson, Delaware, Susquehanna, Potomac, Chowan, Roanoke, Pamlico (or Tar River), Neuse, Cape Fear, Great Pee Dee, Santee, Savannah, and Altamaha, all rivers of at least 300, and some 600 miles in length, and all more or less navigable, some for vessels of the largest class, 100 miles or more, and all emptying themselves directly into the Atlantic, or into bays opening into that ocean. The southern slope, tending to the Gulf of Mexico, has also several large rivers independent of the Mississippi, viz., the Appalachicola, Mobile, and their large tributaries on the east of the Mississippi, and the Sabine, Trinity, Brazos, Colorado, and Rio Grande del Norte on the west of that river. These streams vary in length, including their main affluents, from 300 to 1800 miles, and are navigable by steamboats to various points within 500 miles. The Rio Grande forms the boundary between Texas and Mexico. The Pacific slope has but one great river, breaking through the Cascade Mountains into the ocean. This is the Columbia, a stream of 1500 miles in length, and with several important affluents having courses of from 300 to 800 miles. If we except the Straits of Juan de Fuca, there is but one other great opening into the territory of the United States on the Pacific border, viz., the channel or strait, from 1 to 2 miles in width, leading into the Bay of San Francisco, which receives the Sacramento and San Joaquin rivers, each about 300 miles in length. The Colorado of the west drains the east and south-east and southern portions of the great plateau between the Rocky and Sierra Nevada Mountains.

The whole of the United States north of the forty-second parallel of latitude is dotted over with beautifully transparent sheets of water of varied sizes, from a few miles in circuit to those majestic lakes or inland seas which separate British America from the United States. There are five of these—viz., Ontario, Erie, Huron, Superior, and Michigan; the latter only being wholly within the limits of the United States. These vast lakes are navigated by the fleet of the highest tonnage, and by sailing vessels of all sizes, affording a continuous navigation by the aid of the Welland Canal around the Falls of Niagara, and that around the Saginaw to Marquette, of 1600 miles. These lakes cover an area of from 6300 to 32,000 square miles each, or a total of 90,000 square miles. The other chief lakes of the United States are Lake Champlain, the Great Salt Lake, and Placid, Michigan, and Tiber Lakes.

**Mountains.**—The Rocky Mountains are the most extensive and important in the United States. They are, in reality, a part of the great chain which extends from the Polar Sea, under various names, to the Straits of Magellan, in South America. Commencing at the Pacific coast and going eastward, we come upon a chain of mountains stretching from the Straits of Juan de Fuca to about the thirty-fourth degree of north latitude, where it joins the Sierra Nevada in the south part of California. These mountains are in some places broken into scattered groups, some of which extend at right angles to the coast, but as a range they run parallel to the Pacific. They do not generally rise to an elevation of more than 2000 or 2500 feet. Mount Olympus, however, in the north-west part of Washington territory, attains a height of 8200 feet; Mount St. John's, 8000; Mount Ripley, 7500; and Mount Diablo, 3780 feet—all in California. Proceeding east, we come upon a lofty chain, bearing the name of Cascade range, in Washington territory and Oregon, and Sierra Nevada in California. The greatest heights in the United States are in this chain. Mount Shasta, Mount St. Helen's, Mount Hood, and Mount Rainier, rear their snowy summits to heights varying from 12,000 to 14,000 feet, and some parts of the Sierra Nevada are said to attain about the height of Mont Blanc, in Savoy (15,500 feet). This chain may be said to extend from Alaska to the southern extremity of Old California, at an average distance from the sea of from 100 to 150 miles, and to have a mean elevation of 5000 or 6000 feet. As we extend our journey towards the Atlantic coast, we pass irregular groups of mountains, some reaching the snow-line, and having various appellations, such as Blue, Humboldt, and Wahsatch Mountains, and occupying the great basin between the Cascade and Rocky Mountains. The latter run also parallel to the Pacific, at distances varying from 450 to 850 miles, within the territory of the United States, and attain, in Fremont's Peak (the highest known summit), an elevation of 13,570 feet. Having crossed this (the dividing ridge between the waters flowing into the Pacific and those flowing into the Gulf of Mexico), we descend a long slope of nearly 1000 miles, by an inclination of about 6000 feet from South Pass (on the great route to California and Oregon), to the Mississippi River, the grand recipient of the streams between the Alleghany and the Rocky Mountains. The sources of the Missouri are at about 6000 feet elevation above the sea, those of the Plate at about 7500, of the Arkansas about 8800, and the Rio Grande 11,150 feet. Ascending from the left bank of the Mississippi, we come first, in Kentucky and Tennessee, upon outlying ridges of the great Appalachian range, which extends, with various interruptions, from Maine to Alabama. This is not a high range, though Mount Katahdin in Maine, Mount Washington in New Hampshire, Mount Mansfield in Vermont, and Mount Tahawus or Marcy in New York, reach severally the heights of 5000, 6324, 4280, and 5460 feet. South of New York this chain and its outlying ridges are mostly within an elevation of 2000 feet, though the peaks of Otter and White Top, in the south part of Virginia, and Black Mountain (the highest land east of the Mississippi), range from 4000 to 6476 feet, but in no case do the summits reach the line of perpetual snow. The head waters of the Ohio, Cumberland, and Tennessee rivers, which drain the western slope of the Alleghany range, are at elevations of from 1600 to 2500 feet above the sea.

**Geology.**—The White Mountains consist of granite, which is also very prevalent in the greater part of New Hampshire and Maine. The Rocky Mountains and the Sierra Nevada consist principally of granite intermixed with volcanic matter. Syenite, porphyry, and greenstone occur in the north-west part of the Appalachian chain; gneiss forms the upper portions of New York and New Jersey; most of the mountain summits south of the Juniata

River consist of fucoidal sandstone; and talcose mica, chlorite, and other slates, with crystalline limestone and serpentine, lie along the west side of the primary belt in the middle and south parts of the Union. Blue limestone, red sandstone, shales, anthracite coal measures, and other transition formations flank these rocks in many places. Secondary strata occupy by far the largest portion of the United States; but no strata corresponding in date with the new red sandstone or oolitic groups of Europe appear to be present. Tertiary formations, many of which abound with fossil remains, have been found in many parts of the Atlantic slope, in Alabama, and in the south part of the Mississippi basin; but they seem to be almost exclusively confined to these regions. The most extensive and remarkable alluvial tract is that around the mouth of the Mississippi.

*Minerals.*—The mineral wealth of the United States is more largely diffused than is generally known. Gold has been found in Virginia; and at an early period of the present century North and South Carolina, and the State of Georgia, contributed that metal so considerably to the mint of the United States, that it was deemed desirable to institute branch mints for the deposit of gold and the manufacture of coinage at New Orleans, Charlotte (North Carolina), and Dahlonega (Georgia). At these three branches gold was deposited at different periods to the value of upwards of 33,000,000 dollars. After the discovery of the far more productive gold-fields of California, the search for gold in the Atlantic states was neglected, and the attention of the Americans has been almost exclusively directed to their Pacific gold-fields.

California commenced gold-mining in 1818, and the yield from that date to the present time has been about £250,000,000. Colorado, which has produced the second largest quantity of gold of any of the new divisions of America, is situated immediately west of the State of Kansas, and between that and Utah. The knowledge of it remained very meagre until 1858, when a few adventurers and explorers from Kansas and Georgia followed up the Arkansas River, and found a very superior quality of washed gold in paying quantities. Close to the spot where this discovery was made has sprung up the town of Denver, now the capital of the state—for Colorado was admitted into the Union as the thirty-eighth state in March, 1876. The State of Oregon, the third most productive gold state of America, lies on the Pacific, immediately to the north of California. The district was organized in 1818, and admitted into the Union as a state in 1859. Large quantities of gold also exist in New Mexico and Arizona, Utah, Washington, Idaho, and Montana.

Silver occurs in various parts of the United States, especially in the territories of Nevada, Idaho, and Montana, and in North Carolina. The first named territory, which lies immediately west of Utah, and is situated between that and California, has proved to be most prolific in this metal. This district is said to have been actually untraversed before 1859. In the spring of the following year (1860), a discovery was made of an immense mine of silver, now known as the "Comstock Lode," of which it is said that "no description can give an idea of its wonderful wealth." "The deeper the mine is worked, the richer and wider is the vein. The lode has been traced for a distance of 2 miles, and is believed to extend much further." It is owned by nearly one hundred different companies, whose claims vary from 25 feet to 2000 feet each of the lode. The explorations are extending themselves to other parts of the country. Deposits of silver also exist near Donna (Donna) Ana, in New Mexico, and on the San Saba in Texas. Rich mines of quicksilver are worked at New Almaden, in California, and platinum has been discovered in California, Lancaster, Pennsylvania, and North Carolina.

Probably the richest and purest copper mines in the

world are found in Michigan, on the shores of Lake Superior, where the native metals have been chiselled out in masses, weighing 150 tons of almost unadulterated copper. Mines of this metal, of great richness, are also worked in the south-east of Tennessee, on the Hiwassee River, in North Carolina, and Connecticut, while it exists in greater or less abundance in New Mexico, Missouri, Maryland, Virginia, New Jersey, Pennsylvania, Georgia, and various other parts of the United States.

The Galena great lead district, occupying the north-western portion of Illinois, and the adjoining counties in Wisconsin and Iowa, is exceedingly rich. Mines of the same mineral are also worked in Missouri, Connecticut, New York, and Pennsylvania. Very rich mines of zinc are found in New Jersey; it is also found largely mixed with the lead ore of the Galena district, and in Arkansas, Pennsylvania, and other states. Bismuth, antimony, nickel, and cobalt are all found in Connecticut. Tin has been discovered in small quantities in New Hampshire and Massachusetts.

Iron ore is widely distributed throughout the United States, and is worked principally in Pennsylvania, Michigan, New York, and New Jersey. The state which presents the greatest field for iron-mining in the future is, however, Missouri, which appears to possess an inexhaustible supply of the very best ores. Iron is not found far below the surface of the earth, but in immense masses, or "mountains," towering above the ground. Of these "Iron Mountain" is the largest. It is composed exclusively of iron ore in its purest form. The height of this mountain is 228 feet, and its base covers an area of 500 acres, which is calculated to give 1,655,280,000 cubic feet, or 230,187,375 tons of ore. There is every geological reason to believe that this deposit extends downward, enlarging as it descends; but on the supposition that the base is not extended, every foot of descent below the surface will give 3,000,000 tons of ore. "Pilot Knob," distant about 6 miles from Iron Mountain, is another of these stupendous masses. It rises 581 feet out of the valley in which it stands, and covers an area of 360 acres. There are several other "mountains" in this region, and it is computed that there is iron ore enough in Missouri to furnish 1,000,000 tons per annum of manufactured iron for the next 200 years. Unfortunately, however, the district is deficient in its local supply of suitable coal, and the railway system has hitherto been too incomplete to enable coal to be brought into it profitably. Large quantities of iron ore are also found in Ohio.

Of other minerals, coal is the most abundant. The great anthracite bed in Eastern Pennsylvania is capable of increasing the supply to almost any conceivable demand. Small quantities of this species of coal have been found in some of the New England states and in New York, and a large deposit in North Carolina. A great bed of bituminous coal, commencing on the western slope of the Alleghany Mountains, in Pennsylvania, extends in a wide belt through the western part of that state, through Ohio, West Virginia, Kentucky, Tennessee, and into North Alabama. Insulated bituminous coal-fields also exist in the counties around and west of Richmond, Virginia, and in some of the central counties of North Carolina. The great bituminous coal-field of the west in states occupies a large portion of Missouri, Iowa, and Illinois, where it exists in inexhaustible abundance. Professor Hitchcock is of opinion that a vast coal-field extends from 28° 45' to 43° N. lat., and between 94° 30' and 103° W. lon. It is not meant by this that the coal exists everywhere, but, in the words of the professor, "that a large part of this vast region may be underlain by coal. The greater part may be, and undoubtedly is, covered by newer deposits, but if coal does actually exist, it may be reached beneath the newer rocks, as it has been in like instances in Europe."

Altogether the coal-fields of America are computed to be thirty-six times the size of those of Great Britain and Ireland. The product of the United States mines has enormously increased within the last few years. For household purposes, there is not the same use for coal in America that there is in England. A very large proportion of the population live in a climate so warm, even in the winter months of the year, that fuel, except for culinary uses, is scarcely needed. The supply of wood, moreover, in many of the states, and especially in those north-western districts where fuel is more particularly needed, is so abundant and so cheap that the want of a supply of coal is not yet much felt. Wood is still also very extensively used as fuel for steam-engines. Moreover, it is to be recollected that the water power of America is employed with great effect in working a very large proportion of its stationary machinery. The grist and flour mills, the lumber and saw mills, and very many other of those "establishments," as they are called, which are included in the returns of "manufactories," are exclusively driven by water power. A great saving in fuel is thereby effected.

Connected with coal are the vast deposits of petroleum or rock oil, which have proved such sources of wealth to many localities in the United States. See PETROLEUM.

It will be evident from the foregoing, that the United States can be abundantly supplied from her own resources with most of the more important minerals; but at the present time neither iron nor copper is produced or manufactured in America at so low a rate as in Europe. This is not owing to absence of quantity, to inferiority in quality, or to want of skill, but solely to the difference in the price of labour. Where so much money can be made in other and far easier and more agreeable occupations, it is not to be expected that any large proportion of the population would employ themselves in mining, except under the stimulus of high rates of wages. And hence not only the disproportion between the quantities produced in America and other countries, but the disproportion in the prices of the articles. As America increases in population, and as railways become more available for the transport of freight, the metallic wealth of the country will, no doubt, be extensively developed; but her vast supplies of iron, especially, must rather be regarded as a store for future ages than as a source of wealth to be largely utilized at present.

Copious salt springs abound in various localities in the States, the total annual product being about 8,000,000 bushels. Medicinal mineral springs exist in many places, but those of the greatest repute are the Saratoga, Sharon, New Lebanon, and Avon springs, in New York; the Bedford springs, in Pennsylvania; the different sulphur springs, in Virginia; and the Blue Lick springs, in Kentucky. In the eastern states are extensive tracts of marl, and in different parts of the country nitrates and carbonates of soda and potassa are met with. Extensive beds of gypsum are found in New York, Maine, Virginia, and other states; but the largest bed of this mineral in North America extends from the Arkansas River, in the Indian territory, to the Rio Grande, in Texas, through a space of 400 miles. Building materials of an ornamental character are abundant—viz. marble, fine granite, sandstone, and breccia or conglomerates. Porphyry is found in the vicinity of Boston and on the St. Croix River, between Minnesota and Wisconsin.

*Climate.*—A region so vast as that of the United States must necessarily include almost every variety of climate, from the long and frigid winters of the North, to the almost tropical regions of the South. It is a well-known fact that the temperature of Western Europe is about 10 degrees milder than in the same latitudes in Eastern North America; while California has a climate exceedingly mild, indeed, partaking rather of the character of the tropical regions, especially in the south, with its wet and dry seasons.

Again, on the plateaus of Utah and New Mexico, the climate is similar to that of the plains of Tartary. The summers of the northern part of the United States are as warm as those of Italy, while the winters are scarcely less frigid than those of Sweden and Norway. North of 42° the climate is especially suited to the winter grains; that of the states between 36° and 42° favours the winter grains and Indian corn as staples; and that south of 36° produces cotton, rice, sugar, Indian corn, and some of the tropical fruits. The temperature of the north-eastern states is rendered disagreeable by the cold and chilling winds and frequent fogs from the Atlantic in the spring months, causing pulmonary diseases, which swell the bills of mortality in that region beyond those of any section of the Union except Louisiana. Being shielded by no great chain of mountains towards the north, the great ice-plains of British America pour upon the United States, upon every considerable augmentation of heat in the regions south of them, their cold blasts, causing sudden variations, often to the extent of 30 degrees in a few hours, to be the unpleasant characteristic of the climate of the northern and central United States. Nor are the southern states entirely free from these sudden changes, when periods of unusually cold weather and unseasonable frosts destroy the orange buds of Florida and the cotton blossoms of the other southern states. At New Orleans, although the summer heat is intense, scarcely a winter passes without frost. The western states, from the Pacific to the Cataract Mountains, have a climate almost precisely similar to that of Great Britain, being mild and humid, with frequent showers at all times of the year. The valley between the Cataract and Rocky mountains is very dry and arid, the westerly moist winds being drained in crossing the summits of the former. East of the Mississippi, however, the rains are heavier than in most parts of Europe. The mean annual fall in this part of the Union is about 37½ inches, while that of North-west Europe is only 31½ inches. Evaporation is, however, quicker in America, and there are more dry days there than in Great Britain. The central states have frequently in the same winter a mixture of the mildness of an Italian with the frigidity of a Russian one.

There are local causes affecting the climate of particular districts that must always be taken into consideration. The lakes, for example, mitigate to some degree the temperature of the regions bordering on them, while the elevated table-lands of New Mexico, Utah, and Eastern Oregon are rendered cooler and drier than the same parallels elsewhere. In connection with climate it will be proper to speak of the diseases incident to the different sections of the United States. In the settling of all new countries the breaking up of the sod leads to miasmatic exhalations, producing agues and fevers that are not to be considered climatic, as they rapidly diminish as the country becomes settled. At present the prevailing diseases of the west are intermittent and bilious fevers and dysenteries; of the south, bilious fevers, with occasional desolating visitations of the yellow fever in the Gulf states. The rice swamps of Georgia and South Carolina are fatal to whites, but not to negroes. In fact, nearly all the swamps and river bottoms in the south, especially the most fertile, are more or less malarious. The cholera has generally been more fatal in the Mississippi valley than in other parts of the Union. The most fatal diseases in New England and some of the northern and middle states are consumption and other affections of the lungs. The census tables show the greatest ratio of deaths in Louisiana (about twenty-three to each 1000 persons), and the least in Wisconsin (about nine to each 1000 persons). In Vermont, Iowa, Florida, Georgia, Michigan, Tennessee, North Carolina, Alabama, South Carolina, Pennsylvania, Indiana, Maine, Delaware, New Jersey, Virginia, New Hampshire, Illinois, and Arkansas, the ratio of deaths was the lowest, and in

the order in which they are named—viz. from Vermont, about ten to the 1000, to Arkansas, about fourteen and a half to 1000 persons. The ratio of deaths was highest in the order named, in the following states—viz. Massachusetts, Missouri, Maryland, Connecticut, Kentucky, Rhode Island, Ohio, Mississippi, Texas, and New York; being from about nineteen and a half in Massachusetts, to about fourteen and a half to the 1000 in New York. It is proper to remark in regard to Florida, which is in winter a great resort for invalids from the North—in consequence of the evenness of the temperature, it never varying above 12 degrees—that the catalogue of deaths may not have fairly represented the character of the state. In fact, part of Florida, the eastern slope of the Alleghanies, Vermont, the elevated country around the Gulf of Mexico, California, and Oregon, are among the most salubrious parts of the world.

*Botanical Productions.*—Botanists arrange the trees and shrubs of the United States in several provinces, each marked by a distinctive character and fixed limits. Two of these provinces extend northward into Canada, and two others pass over the boundaries in the south-west into Mexico; but the greater part is confined within the limits of the United States.

1. The Lacustrine province extends along the basin of the great lakes and the St. Lawrence, and has for its boundaries the limit of forests on the north, the coasts of Labrador on the east, the line of 43° N. lat. on the coast, curving gradually southward to the Alleghanies, where it ascends again to the parallel of 60° at the Rocky Mountains. Among the characteristic trees of this province are the birch, of which five species are found; two species of alder, four of poplar, and four of spruce or fir. Allied to the last-named are the pines, of which three only are found here—viz. the gray scrub pine, red or Norway pine, and white pine. There are two junipers, known as northern juniper and red cedar. The Canadian arbor vitae, Canadian yew, and the larch tamarack are the only other evergreens. There are three species of cherry, and allied to these is the northern wild plum. There are four species of maple, three of ash, two of elm, and four of oak. The linden or basswood and red beech occur sometimes in large numbers, forming almost entire forests; the hop, horebean, ironwood or leverwood, is less abundant, but occasionally appears with other trees. The box elder, the smooth sumach, and the service berry are the principal tree-like shrubs of the province.

2. The Appalachian province comprises all the Atlantic states south of 43° lat. and east of the border of the prairies, including thus both slopes of the Alleghanies and the low lands between them and the coast, as well as the Tennessee and Ozark mountains. This is divided for convenience into six regions, whose names sufficiently explain their situation—viz. the Alleghany, Ohio, Tennessee, Carolina, Mississippi, and Florida regions. The trees of the Alleghany region are to a considerable extent allied, though often of different species, to those of the Lacustrine province. Evergreens are not abundant, four species only—the northern pitch pine, table mountain pine, Jersey scrub pine, and southern balsam fir—being all that are peculiar to the region. There are several varieties of oak, chestnut, hickory, walnut, and ash; and one each of logwood, willow, buttonwood, maple, sassafras, crab apple, locust, and fringe tree; of shrubs, two species of sumach, the velvet and poison, are the principal which are peculiar to the region. There are three species and numerous varieties of the grape common to this and the Ohio region, and one of them also to the Tennessee region. The Ohio region has but few characteristic trees, the most prominent being the Ohio buckeye, redbud, scarlet, and swamp oak, three hawthorns, a soft maple, the northern hackberry, and the northern prickly ash. To the Tennessee region belong the pawpaw, the cucumber tree, and the several varieties

of some of the most useful woods peculiar to Alleghany. The coast or Carolina region, which really extends from Maine to Georgia, has for its characteristic trees the dogwood, magnolia, hawthorn, cypress, palmetto, pine, tulip tree, and oak, of each of which there are several species, one of the pines and the live oak being of very great commercial importance, as furnishing very fine timber. The characteristic forest vegetation of the Mississippi region consists rather in large forests of particular species than in any considerable number of species. The cottonwood is abundant along the streams; the cypress, swamp oak, hickory, and ash are also found in low situations. The catalpa, plane tree, and buckwheat tree, are among the more remarkable of the forest trees native to this region. The lime, lemon, orange, and fig, which have been introduced from the West Indies, flourish luxuriantly. In the Florida region the principal forest trees are the live oak, the Eugenia, the stinking cedar, two species of fig, the bitter wood, the bark of which is used for medicinal purposes, wild plum, cocoa plum, true pawpaw, custard apple, broad-pod acacia, box-leaved guava, and the broad-leaved poison sumach. A peculiarity of the region is the predominance of fruit-bearing trees.

3. The Campestrian province comprises the vast extent of prairie lands, reaching from the Saskatchewan on the north to Texas on the south. The province is mostly treeless, except near the streams, and has very few trees which are not common to it with the Mississippi, Ohio, and Canadian regions.

4. The Rocky Mountains province, like the preceding, has few peculiar or characteristic trees as yet known. The table-lands stretching eastward from the summits of the Rocky Mountain range are treeless and almost verdureless, except on the immediate banks of the streams, where a few cottonwood and other trees of quick growth and spongy fibre are found.

5. Of the Caurine or North-western province, only Washington territory and Oregon above lat. 42° 30' belong to the United States. The abundant moisture of this region develops forest trees of immense height and girth; and though the number of genera is not as great as in the Appalachian province, there is a very considerable number of species, the evergreens predominating.

6. The Nevadian province, extending from 42° 30' to 32° N. lat., is the home of the giant pines, cedars, and redwoods, trees of unparalleled size, many species of which are peculiar to this province.

7. The Mexican province, including New Mexico, Arizona, and Northern Texas, is divided into three distinct regions, rising in successive table-lands from the low sandy desert to the Llano Estacado or Staked Plain, and the plateau of New Mexico. Except in isolated tracts, this province is not marked by an abundant forest growth, but the greater part of its trees are at least semitropical in character.

The character and quantity of forest vegetation is largely controlled by climatic influences. A humid climate, even if accompanied by low temperature, is favourable to the growth of timber; and hence we find Northern Maine, New Hampshire, Vermont, and New York covered with immense forests. Where the cold is intense, and the fall of rain moderate, the trees, except the hardiest, are killed by the deep frosts. The trees of these cold regions are for the most part evergreens, though some species of the oak, beech, &c., thrive. In the Appalachian region, again, forests are more abundant on the eastern slope of the Alleghanies than on the western, and far more so than in the Campestrian or prairie province, because the amount of rain is greater and the moisture more uniformly maintained. The clouds rising from the Atlantic are deprived of the greater portion of their moisture in their passage westward, and disappear in passing the Alleghanies. But

for the great lake region of the north, which yields to the clouds a daily evaporation nearly or quite equal to one-third of that of the North Atlantic, and the Gulf of Mexico at the south, the vapours of which are driven northward by the south winds, the Mississippi valley would form another desert like that of Gobi. Along the western coast of North America there are forests of gigantic growth on the seaward slope of the Cascade and Coast ranges; while eastward of these ranges is a treeless region, where fuel can only be procured from the deposits of coal, and where crops can only be produced by irrigation. Lying between this and the head waters of the western affluents of the Missouri and Mississippi, is a still more barren and verdureless region, where rain rarely falls, and where, except along the banks of streams fed by the melting of the mountain snows, there is neither food for cattle nor fuel for the use of man.

The grasses indigenous to the United States are very numerous, and some of them of great value. Botanists enumerate seventy-one genera and 261 species of native Gramineæ, including under this title some of the cereal grains and several species of maize, sorghum, sugar-cane, &c. In the northern and middle states the cultivated grasses are mostly of European origin and naturalized; but in the other districts there are many native species fully equal to these. Among such are the wild rice, found principally in the vicinity of the lakes and river banks; the bent grass, oat grass, and musquit grass, a native of Texas, of which there are several species and many varieties, furnishing most luxurious and nutritious pasturage to the cattle and sheep of that region; sorrel grass, wild rye, a native of the Gulf states, highly prized for a winter pasture; the blue grass, regarded throughout Kentucky and Tennessee as the best pasture grass known; wild oats or union grass, Bermuda grass, Oregon grass, Utah grass, &c.

Embracing a territory of such extent, the number and variety of flowering plants in the United States are very great. Each region has its flora, and each season its characteristic blossoms. In the north eastern and middle states the most noticeable of the flowers of early spring are the brilliant blossoms of some of the Compositæ, and especially in the lowlands the bright yellow of the dandelion; a little later the dogwood is in full blossom, the tree being completely whitened with its creamy white flowers; the snowy blossoms of the hawthorn are seen in all parts of the country; still later the wild roses and eglantines, as fragrant as beautiful, the showy broad-leaved laurel, blueberry and whortleberry, with their delicate pink and white flowers, as well as most of the fruit-bearing trees, are in full blossom. In October and November the neglected fields and roadsides are brilliant with the pink flowers of the aster and the nodding plumes of the solidago or golden rod. In May and June the prairies are resplendent with flowers of all hues. The deep blue of the larkspur violet; the white, red, and purple of the Houstonia, and the variegated clusters of Claytonia, Caroliniana, and Virginica, appropriately named "spring beauty," blending with the rich golden hues of other flowers, make a western prairie an attractive object. In the region extending from Carolina to Louisiana the magnolia, pinxter bloom, and rhododendron are the finest of the flowering shrubs; while the numerous species of clematis, with their white and purple flowers, the golden blooms of the *Hypericum aureum*, the bright scarlet of the splendid catchfly, and the purple and carnation of the hibiscus, form a rich blending of colours. Although the modest flowers of the hawthorn are not conspicuous among the more gorgeous semitropical flora, its fruit attracts attention from the brilliancy of its colour. The southern states have no native rose, unless the Cherokee rose, usually said to have been brought from China, be really indigenous there. Among other very beautiful speci-

mens are the hardback, with its rose-coloured corymb of blossoms, the sweet-scented shrub, the evening primrose, and the passion-flower, a native of North and South Carolina. The coarse but brilliant lobelias, and the asters and golden rods, make up their full share of the flowers of autumn. Their monotony is relieved by other blooms equally showy and less coarse and weedlike in appearance. Texas has in many respects a different flora from any of the neighbouring states. Through April and May, and into the earlier days of June, a variety of brilliant flowers continue to blossom; but the summer heats soon dry up vegetation, except along the banks of the streams; the grasses protect their green leaves from the fierce and continuous heat by the thatch of dead grass which falls over them, and for two months nature dresses in russet, until, with the autumnal rains, new flowers spring up. Of solidago but a single species is known in Texas, and that not very abundant. A few species of the aster make their appearance, and the dahlia, a native of Mexico, finds its way across the border, but displays few of that infinitude of colours which careful cultivation has produced in the northern states and in Europe. The region north of Texas, and extending through Arizona, New Mexico, Utah, and Colorado, is not prolific in flowers. The flora of California and Oregon is very abundant, and differs greatly in character from that of the country lying east of the Sierra Nevada or the Rocky Mountains. The indigenous plant of California which in its season of flowering most attracts attention is the flowering currant, whose large crimson racemes are unrivalled in beauty; a kindred species is found in Oregon. A peculiarity of the flora of California is the almost entire absence of genera belonging to the two great orders Rosaceæ and Compositæ. The large genera of hawthorns, cherries, plums, apples, and bramble in the former are scarcely represented at all; while in the latter we miss aster, solidago, sunflower, tealane, bonset, &c. The deficiency is, however, more than made up by the amplitude of other orders. In general it may be said that the flora of the United States comprises few or none of the great staples of food; the cereal and all the esculent roots are naturalized, but are by no means deteriorated by their transfer. The cucumbers, melons, squashes, &c., are also all naturalized, as are most of the fruits, especially the apple, pear, plum, peach, quince, and apricot. The edible berries, such as the strawberry, blackberry, raspberry, whortleberry, bilberry, cloudberry, &c., are indigenous. The great fibrous staples, too, cotton, flax, and hemp, are naturalized plants; while the agave, which possesses some qualities analogous to the last of these, is a native of the adjacent country of Mexico.

**Zoology.**—The zoology of the United States is essentially that of North America, nearly every species found on the North American continent having its habitat in some part of the states or territories. The Quadrumana, embracing the entire monkey tribe and its congeners, are wanting. Of the bat tribe there are three genera and eleven species. Of the Carnivora, the largest is the cougar or catamount, often improperly called panther, which is not a native of America; it is a formidable animal, second in strength and ferocity to the lion and Bengal tiger. The wild cat, or bay lynx, and the Canadian lynx are the only other animals of the cat tribe. There are six species of the fox, and two of wolves. Of the bear tribe, there are the black bear, the grisly bear, the badger, the wolverine or glutton, six species of skunk, and two of the raccoon. The common seal is the only representative of its family in America. Among the deer family there is the moose, now confined to the north-eastern states, and very scarce even there; the wapiti, commonly called the elk; five or six species of deer, one or two of antelope, and one of the sheep family—the bighorn or Rocky Mountain sheep. The bison, or buffalo, is the only wild representative of the



ox family. Of the amphibious mammals, a singular species of the manatee or sea-cow frequents the shores of Florida and the Gulf of Mexico. The porpoise, five or six species of dolphin, and the narwhal, are found along the coast. The smaller species of whale are not uncommon, while the great sperm whale appears at some distance from the coast. The Insectivora are represented by seven or eight species of the mole and twelve species of shrew mole, all of them belonging to the genus *Sorex*. Among the Rodentia in the United States are the beaver, porcupine, squirrel, rat and mouse tribes, lemming, and rabbit, of each of which there are many distinct genera and species. The opossum is the single representative of the mammals forming so important a class in Australia. Of birds, the kinds are exceedingly numerous, there being in some cases no less than forty species of a particular genus. There are five species of eagle, six of vulture, and thirty of hawk. The Scansores, or climbers, are represented by the Carolina parrot, the only bird of the parrot tribe in the United States, and the woodpecker. The order Insectores includes the thrush tribe, with the bird called robin (an entirely different bird to the one known by that name in Great Britain), the mocking bird, and the cat-bird; the swallows, the finch tribe, which includes the sparrows; the kingfishers, crows, orioles, grackles or starlings, and humming-birds. Of Rasores, pigeons and doves of numerous species are found in vast numbers in the wooded portions of the western and north-western states, and are not uncommon in nearly every other part of the Union. There are no true partridges in the United States, the partridge of the northern states being a grouse, and that of the southern a quail; but grouse of many species, quail, wild turkey, and several other gallinaceous birds occur in great numbers. Of the Gradatores, or waders, there are the flamingo, heron, ibis, crane, coot, rail, sandpiper, avocet, snipe, gray plover, &c. The Natatores, or swimmers, are very numerous, there being about twenty species of geese, two of swans, and at least twenty of the duck family. There are also two species of pelicans, confined to the Gulf states, several of gulls, and half-a dozen of cormorants.

In reptiles the United States are not very prolific. There is a considerable variety of tortoises, though few of great size; and the small islets along the coast of Florida, and the sandy spits along the shores of the Southern Atlantic and Gulf states, are frequented by the green and other sea turtles in large numbers. The alligator inhabits the rivers and bays of the Gulf states, and proves very destructive to cattle and small animals—sometimes, though rarely, attacking men. The Saurians are abundant, especially in the southern states, and include a great variety of lizards (the chameleon among others), skinks, horned frogs, monitors, &c. The Ophidians or serpents are very numerous, but only three genera, the rattlesnakes, moccasins, and the vipers, are venomous. The black snake is the only boa in the States. The Batrachians embrace numerous species of frogs, toads, sirens, newts, and salamanders.

There is an immense number of genera and species of fish visiting or inhabiting the waters of the United States. The most remarkable of the spine-finned are the pickerel, perch, mackerel, sword-fish, and mullet. Among those with soft abdominal fins, the best known are the salmon, the shad, the menhaden, herring, pike, and carp; of those with soft fins at the throat, the cod (the fishery of which employs a very large force of men, and furnishes food for many thousands), flounders, flat fish, &c.; and of fish without ventral fins, several species of eels, both of fresh and salt water, and the humprey. The shark, ray or skate, and the devil fish, are the most formidable of the monsters of the deep on the American coasts. Other fish well known and highly prized for the table are the halibut, tautog, blue fish, sea and striped bass, tom cod, porgy,

&c.; and from the rivers and lakes the perch, roach, dace, brook trout, lake trout, giant pike or muscalonge, and the white fish of the lakes. Of molluscs, the Acephala are widely distributed on the sea-coast and through the lakes and rivers. The oyster attains a very excellent flavour; and the soft-shelled clam and round clam are also valued as articles of food. Others of the order are the mussel, cockle, hammer shell, &c. The pearl oyster has been found on the Californian coast, and many secrete pearls of considerable value. There are numerous genera and species of land snails and slugs, land soles, pond snails, limpets, whelks, ear-shells, nitre shells, and others. The Crustacea are very plentiful, and many of them edible. Crabs, lobsters, shrimps, &c., abound on the sea-coast; and the fresh-water lobster and land crab are found in the interior. The wood louse is common everywhere in damp places; and many of the parasitic insects of this class are very abundant. There are some venomous species of the scorpion and spider, but the spiders, mites, &c., are for the most part harmless. The centipede, though properly belonging to the tropics, is occasionally found in the south-western states.

The insect tribe is very numerous. Beetles of many genera abound, as do locusts of not less than twenty-two species, some of them destructive to vegetation, but none of them to be compared to the locust of Oriental countries. There are also the bee, wasp, hornet, and bumble-bee; a vast and beautiful tribe of butterflies; grasshoppers of many species; the whole family of flies, among which, besides the house pests, there is a blistering fly nearly equal to the Spanish. Other insect orders all have their representative; and as the tropics are approached their number and variety greatly increase. The Annelida have many representatives in the numerous worms which infest the country, some of them destroying the foliage of the trees, others penetrating the wood and roots of trees and esculent vegetables. The leech, which inhabits marshy ponds, though not equal in power to the Swedish leech, is yet formidable to those who expose themselves to its attacks.

*Soil and Agriculture.*—The diversity in respect to soil in the United States is, perhaps, even more striking than that of climate, the extreme on the one hand being found in the rich alluvial deposits of the great Mississippi valley (where the mould is several feet deep), and on the other, in the barren plains of Nevada, New Mexico, Utah, and Indian territories. The agricultural capabilities of the Mississippi valley are believed to be unequalled on the globe, if perhaps we except the valley of the Amazon in South America. A belt of land of tertiary formation coasts the Atlantic from Long Island to the Gulf of Mexico (inclusive of both), which is about 60 miles in width, and mostly covered with pine and cedar, not very productive in its natural state, but easily improved by marl and other manures. The coasts of Massachusetts and Maine, and of New England generally, are rough, unproductive, and difficult of tillage, being better adapted to grazing than culture. The slopes of the Alleghanies and the hilly region at their feet are generally productive, especially in the valleys, while the Pacific watershed has comparatively only a small portion of cultivable land; but in that portion west of the Cascade Mountains, as in the valleys of the Willamette, Sacramento, San Joaquin, and other smaller rivers near the coast, the fertility is great. The slopes of the Rocky Mountains are generally a barren lava, through which the rivers cut their way to great depths without fertile valleys to border them. Deducting rivers and lakes the land surface of the United States is 1,326,686,800 acres. Of this area 1,450,000,000 are public lands, nearly one-third of which has been surveyed, and about 450,000,000 acres disposed of by sales and grants. The lands are surveyed by the government, divided into townships 6 miles square: subdivided into

sections, and these into quarter sections of 160 acres each, which are set apart for homesteads. The system of squares by which every section and quarter-section is divided by lines running due north and south, east and west, precludes all dispute as to boundary or title. As the country is filled up and settled, new surveys are made, and undoubtedly one of the great attractions of the United States is, that there is so boundless an expanse of territory that for many years the price of land is not likely to be unduly raised by an immigration, however great, or by other means than the application of industry to the cultivation of the soil. At the census of 1880 there were 536,081,835 acres taken up in farms, being less than 80 per cent. of the total area, excluding Alaska and the Indian territory. Of this area 281,771,042 acres, or a little more than one-half, were returned as improved. In 1870 the farm acreage was 407,735,911. The following table shows the number of farms of different sizes in 1870 and 1880:—

Acres.	1870.	1880.
Under 3 acres, . . . . .	6,875	4,352
3 and under 10 . . . . .	172,021	134,889
10 " 20 . . . . .	294,607	254,749
20 " 50 . . . . .	847,614	781,474
50 " 100 . . . . .	754,221	1,032,910
100 " 500 . . . . .	565,054	1,695,983
500 " 1000 . . . . .	15,873	75,972
1000 and over,	3,720	28,578
	2,659,985	4,008,907

It will thus be seen that the smaller farms decreased in number during the decade, and that while those between 50 and 100 only increased 37 per cent., those between 100 and 500 trebled, those between 500 and 1000 quintupled, while those above 1000 acres were eight times more in number than in 1870. Over 18,000,000 acres are in the hands of eight proprietors, while the great railway companies own 200,000,000 acres. The total value of farms in 1880 was £2,039,419,355, and in 1870, £1,852,560,772.

Much of the land in the northern states is cultivated by its owners, who resemble the tenants in Scotland and assist in the manual labour of the farm. But in those parts of the country which have long been settled the farmers are opulent and hire a great deal of labour. In the South estates are much larger than in the North. Almost every farmer in the eastern states who has a family or is in straitened circumstances is willing to sell his land and move to the west, where he can obtain soil of an equal or better quality at one-twentieth of the price.

Among the objects of culture in the United States maize takes precedence in the extent of its cultivation, as it is best adapted to the soil and climate, and forms the chief food for the people, as well as of animals, both in the North and in the South. The first successful attempt of the English to cultivate this grain in the present territory of the United States was made in the valley of the James River, Virginia, in 1608. The yield at that time is represented to have been from two hundred to more than one thousand fold. The present produce varies from 20 to 135 bushels to the acre. The quantity raised in 1850 was 592,971,101 bushels; in 1885 it had increased to more than 1,936,000,000 bushels. The wheat-growing region is gradually shifting westward. Not many years since Virginia was the largest wheat-producing state; in 1847 Ohio held the first place; in 1860, Illinois; now it is California, Minnesota, and Michigan.

Wheat, when the soil and climate are adapted to its growth, is preferred to all other grains, and next to maize

is the most important crop in the United States, not only on account of its general use for bread, but for its safety and convenience for exportation. The wheat region of the United States east of the Rocky Mountains lies chiefly between the thirtieth and fiftieth parallels of north latitude; west of that barrier it extends one or more degrees further north. The culture of rye is principally restricted to the eastern and middle states, but in some parts it is giving place to more profitable crops. The yield varies from 10 to 30 or more bushels per acre. In the Atlantic states the growth of barley is confined to the tract lying between the thirtieth and fiftieth parallels of north latitude; on the Pacific side of the continent its range is principally between the twentieth and sixty-second degrees of north latitude. The barley chiefly cultivated is the two-rowed kind, which is preferred for the fulness of its grain and its freedom from smut. The yield usually varies from 30 to 50 bushels per acre, weighing from 45 to 55 lbs. to the bushel. Barley has never been much exported, being principally used in the manufacture of malt and spirituous liquors at home. Buckwheat appears not to have been much cultivated prior to the last century. It is chiefly raised in the middle and New England states. From 30 to 45 bushels per acre is considered an average yield in favourable seasons and on suitable soils, but 60 bushels are not unfrequently obtained. Oats may be regarded as constituting one of the important crops in the United States. They are so hardy as to be suited to climates too hot and too cold either for wheat or rye. The growth is confined principally to the northern, middle, and western states. The yield varies from 40 to 90 bushels per acre, weighing from 25 to 40 lbs. per bushel.

The kidney bean is said to have been extensively cultivated by the Indians of New York and New England long before the whites established themselves there, and both beans and peas were largely cultivated by the natives of Virginia prior to the first landing of Captain John Smith. The cultivation of the pea as a field crop is chiefly confined to the eastern, middle, and western states. The usual yield is from 25 to 40 bushels per acre, weighing about 64 lbs. to the bushel.

Rice was first introduced into Virginia by Sir William Berkeley in 1647, and into the Carolinas in 1694. Its culture in Louisiana was commenced in 1718 by the Company of the West. This grain in the United States is chiefly confined to South Carolina (which produces nearly two-thirds of the whole quantity raised in the United States), North Carolina, Georgia, Florida, Mississippi, Louisiana, and Texas. The yield per acre varies from 20 to 60 bushels, weighing from 45 to 48 lbs. when cleaned. Under favourable circumstances as many as 90 bushels to an acre have been raised. Another variety called Cochinchina or dry mountain rice, from its adaptation to a dry soil without irrigation, is cultivated to a limited extent. It will grow several degrees further north than the South Carolina rice, but yields only 15 or 20 bushels to the acre.

The common Irish (or white) potato is regarded as of but little less importance in the national economy than maize, wheat, or rice. It has been found, in an indigenous state, in Chili, Paraguay, Ecuador, as well as in Santa Fé de Bogota, and more recently in Mexico, on the banks of the Orizaba. It was not until near the middle of the seventeenth century that it became generally known either in Britain or North America. In the United States it is chiefly confined to the northern, middle, and western states. Its perfection, however, depends much upon the soil and the climate in which it grows. The yield varies from 50 to 400 bushels per acre, but generally it is below 200 bushels. Sweet potatoes, a native of the East Indies and of intertropical America, appear to have been introduced into Carolina, Georgia, and Virginia soon after their settlement by Europeans, being mentioned as early as 1644. It grows in excessive abundance throughout the southern



states, and as far north as New Jersey and South Michigan. Turnips are little cultivated, the climate generally being too dry.

The growth of hay is principally confined to the eastern, middle, and western states, from which the southern markets are mainly supplied, in the form of pressed packages or bales.

Large quantities of hops are cultivated, in consequence of the growing demand in America for beer, which is, however, for the most part extremely badly made, by brewers who emulate the German lager beer production.

The tobacco plant is indigenous to Central America, and was cultivated by the aborigines in various parts of the continent previous to its discovery by Europeans. Sir Richard Greenville found it in Virginia in 1585, when the English for the first time saw it smoked by the natives in pipes made of clay. Previous to the War of Independence nearly all Europe was supplied from America, but it is now grown in many countries in Europe and Asia.

The introduction of the sugar-cane into Florida, Texas, and Louisiana is supposed to date back to their earliest settlement by the Spaniards or French. A perennial plant, very sensitive to cold, it is necessarily restricted to regions bordering on the tropics. On the Atlantic side of the States it does not thrive beyond the thirty-third degree of north latitude, and the thirty-fifth parallel south. The quantity of sugar produced on an acre varies from 500 to 3000 lbs., averaging perhaps from 800 to 1000 lbs.

As yet the vine does not rank high among the articles grown in the United States, but its cultivation is rapidly extending in California. It is also grown in Ohio, Pennsylvania, Indiana, and North Carolina. The annual consumption of foreign wines in the States averages only about one-fourth of a gallon to each person.

The cotton-plant stands pre-eminent in the United States, both as regards its superior staple and the degree of perfection it has attained. The precise time of its introduction as an object of culture by the American colonists is not known. The seed of the Sea Island cotton was introduced from the Bahama Islands about the year 1785. It was first cultivated on Skidaway Island, near Savannah, and subsequently on St. Simon's Island, at the mouth of the Altamaha, and on Jekyll Island. Previous to 1794—the year after the invention of Whitney's saw gin—the amount of cotton produced in North America was comparatively inconsiderable; but since that period there is probably nothing recorded in the history of industry (including its manufacture in America and Europe) that can compare with its wonderful increase. The chief varieties cultivated in the United States are the black seed or Sea Island (*Gossypium arboreum*—a tree cotton indigenous to India), known also by the name of "long staple," from its fine, white, silky appearance and long fibres; the green seed (*Gossypium herbaceum*), called "short staple," from its shorter, white staple, with green seeds, and commercially known by the name of upland cotton; and two kinds of Naukin or yellow (*Gossypium barbadense*), the Mexican and Petit Gulf. The average yield is about 500 lbs. to the acre. Mississippi occupies the first place as a cotton-growing state, having nearly trebled its production since 1850. The total quantity cultivated in the United States in 1840 was 790,469,275 lbs.; in 1850, 987,449,600 lbs.; and in 1860, 2,154,220,800 lbs. This was the largest quantity ever produced up to that time in one year. During the war which immediately ensued the product received a check from which it did not recover for many years. The total quantity gathered in 1870 amounted to 1,400,578,140 lbs., and it has now reached nearly 3,000,000,000 lbs.

With the exception of the law of primogeniture, the tenure of land in the United States does not much differ from that of this country; but with comparatively little

difference in law between the two nations, there is a very great difference in fact, in consequence of the extreme cheapness of land in America and the facility of acquiring it. The theory and practice of the country is for every man to own his house and land as soon as possible, and the term "landlord" is an obnoxious one. The tenant class is diminishing, and is chiefly supplied by immigration. The cultivation of the soil is so remunerative that tenants may soon accumulate the means of purchasing their land and becoming proprietors. Unoccupied land may be purchased of the government on terms which give every facility with regard to payment—the policy originally adopted relative to the public lands having undergone essential modifications. Immediate revenue, and not their rapid settlement, was formerly the cardinal feature of the system. Long experience resulted in the conviction that the early development of the agricultural resources of the country, and the diffusion of an energetic population over its vast territory, are objects of far greater importance to the national growth and prosperity than the proceeds of the sale of the land to the highest bidder in open market. The pre-emption laws, therefore, confer upon the pioneer who complies with the terms they impose the privilege of purchasing a limited portion of unoccupied lands at the minimum price. The homestead enactments relieve the settler from the payment of purchase money, and secure him a permanent home, upon the condition of residence for a term of years. Under these circumstances the possession of land does not of itself bestow upon a man, as it does in Europe, a title to consideration. Conveyances of landed property are not expensive. For ordinary deeds the charges scarcely exceed £2; but when the lands are of value, and legal opinions on the title are obtained and abstracts made out, the costs may reach £15 or upwards. There is a registry of deeds in each county; registration does not confer a title, but protects a purchaser against unregistered deeds.

The practice of agriculture in the United States must be described as extremely defective, judged by the standard of European countries. Draining is not much attended to, and manures are seldom used except near the large towns and in the oldest cultivated districts. The production of the country might be largely increased if a proper system of drainage and improved methods of cultivation were carried out. The fertility and cheapness of land, however, do not render careful husbandry so essential as in older countries, where the area of land is more limited. The gradual shifting westward of the centre of the wheat-growing region shows the progressive abandonment of old soils for new ones. The general economy in the United States is of labour, not of land; for in consequence of the high price of the former commodity, in no country in the world has such an amount of ingenuity been exercised in the production of labour-saving machinery, and nowhere has it been so successfully applied to the commonest operations of agriculture. Machinery is taken about the country to do the work on farms where it is wanted. Permanent farm labourers generally live with or on the property of their employers. As already intimated, tenancy cannot be said to exist as a system in the United States; but there are exceptions to the rule. Rent is not always payable in money, but payments in kind are not very common now, except in the southern states. In Virginia a landowner often lets a farm, receiving as rent two-fifths of the agricultural produce and one-half of the fruit, poultry, and produce of live stock. In most states the landlord has a right of distress; but in some he has to take a summary proceeding to establish the amount, and then has a preferred lien on the tenant's property on the premises, or elsewhere if removed after proceedings commenced. Improvements and fixtures made by the tenant, for the purpose of trade and commerce, are removable by him.

The immense extent of land forming part of the United States as yet uninhabited and uncultivated is held to be national property, at the disposal of Congress and the executive of the republic. The public lands of the United States which are still undisposed of lie in nineteen states and eight territories. The public lands are divided into two great classes. The one class has a dollar and a quarter an acre designated as the minimum price, and the other two dollars and a half an acre, the latter being the alternate sections reserved by the United States in land grants to railways, &c. Titles to these lands may be acquired by private entry or location under the homestead, pre-emption, and timber-culture laws; or, as to some classes, by purchase for cash. The homestead laws give the right to 160 acres of a dollar-and-a-quarter lands, or to 80 acres of two-dollar-and-a-half lands, to any citizen or applicant for citizenship over twenty-one who will actually settle upon and cultivate the land. The title is perfected by the issue of a patent after five years of actual settlement. The only charges in the case of homestead entries are fees and commissions. Another large class of free entries of public lands is that provided for under the Timber Culture Acts of 1873-78. The purpose of these laws is to promote the growth of forest trees on the public lands. They give the right to any settler who has cultivated for two years as much as 5 acres in trees to an 80-acre homestead, or if 10 acres, to a homestead of 160 acres, and a free patent for his land is given him at the end of three years instead of five. Up to the middle of 1885 there were 1,817,063,588 acres of public lands in the states and territories, of which 969,245,192 had been surveyed. Of the total area of the United States, 1,400,000 square miles, or 896,000,000 acres, were unoccupied at the census of 1880. Upwards of 88,000,000 acres of land are settled under the Homestead and Timber Culture Acts. It is provided by law that two sections of 640 acres of land in each township are reserved for common schools, so that the spread of education may go together with colonization.

The power of Congress over the public territory is exclusive and universal, except so far as restrained by stipulations in the original cessions.

*Live Stock and Provision Trade.*—In treating of the agricultural products of the United States due consideration must be given to their stock, which is not only important as regards home supply, but the extent to which beef and pork are exported renders this business important in considering the subject of national resources. The total number of animals in 1886 was as follows:—

	Number.
Horses, . . . . .	10,077,657
Mules and Asses, . . . . .	2,084,593
Cattle of all kinds, . . . . .	45,510,630
Sheep, . . . . .	48,383,331
Swine, . . . . .	46,092,813

Highly bred horses are admittedly very rare in America, and there appears to be nothing in the country that compares in any way with European studs. The breeding of them has not been sufficiently regarded, and consequently the race is comparatively inferior. The Conestoga horse is, however, as a beast of burden, a very highly prized animal. He derives his name from a valley in Pennsylvania, to which state the original stock is supposed to have been introduced by some of its earliest settlers. The Conestoga combines great strength with lightness and agility.

In the southern and Pacific states mules and asses are largely used as substitutes for horses. The mule is harder than the horse, subject to fewer diseases, more patient, better adapted for travelling over rugged and trackless surfaces, less fastidious as to food, much less costly in feeding. He requires less grooming and attention, and usually

lives and works to double the age of the horse. A mule is also more muscular in proportion to weight; and as a troop of mules will follow their leader, if that leader is only provided with a bell, they require on a journey much less attendance than a troop of horses. Hence, in many parts of the United States mules are largely used as beasts of burden, their power of endurance and determined perseverance enabling them to overcome difficulties which are peculiar to that class of service. With improved means, however, of railway and other communication extending on every hand the use of mule-carriage is becoming less.

A breed of short-horned cattle, originally imported from the valley of the Tees, appears to be among the most highly appreciated of any in the United States. The Americans boast that they have considerably improved on the original stock. "Ayrshires" are much prized in Massachusetts, and have passed in some numbers into Michigan and the north-western states.

The dairy produce of the United States is very great, and between 1870 and 1880 it showed an increase in butter from 514,092,683 lbs. to 777,250,287 lbs. The principal butter and cheese producing states are those most largely settled, as New York, Pennsylvania, Ohio, &c. New York supplies nearly one-fourth of all the butter made in the United States, and fully one-third of the cheese. Cheese does not enter largely into the dietary of the people of the United States; and the quantity produced (over 200,000,000 lbs. per annum) not only meets the demand, but leaves a considerable surplus for exportation. A cheese factory system is carried on in the great dairy districts of the state of New York and parts adjacent. Each farmer sends his milk to the dairy, and is credited for the quantity supplied. Skilled persons are employed at the factories to make the cheese; and it has been found that these factories turn out an article of far better quality than used to be made in private dairies. Pains have also been taken to suit the requirements of the European market, and the result has been such high rates of profit to the farmers and manufacturers as have very greatly stimulated the business. The quantity of cheese imported into the United Kingdom from the States in 1886 was 850,000 cwts., valued at £1,830,000.

Sheep until very recently have not been generally reared in the United States, either for their wool or for any other purpose than for the supply of mutton to the home population.

The hog is the animal by which the Americans for many years made their largest profits. The raising of swine proved to be so well adapted to the varied phases of agriculture in the States that there is no district in which it is not carried on. Its commercial importance, however, has been coeval with the development of the western states, which is mainly accounted for by natural causes. First, the animal flourishes best in a temperate climate; secondly, the country in which he is reared should be peculiarly productive of the most fattening descriptions of food; and thirdly, in order to effect the processes of cure with the least expense and the greatest certainty the climate should admit of a somewhat severe winter. All these conditions are realized in the western states more perfectly than elsewhere. They have a temperate climate in summer; a soil which produces in the utmost abundance Indian corn, which proves to be the best of all possible food for the hog; and a winter temperature well suited to every process requisite to the curing, packing, and export of meat. Thus immense numbers of swine are bred, and cities like Cincinnati and Chicago have risen into importance on account of the trade.

The average yield of lard and weight of hogs packed is stated at—yield of lard, 84 lbs.; average weight of hogs, 192 lbs. Every item of the animal is turned to account, and the trade in bristles, lard, oil, stearine, grease, skins,

&c., has grown to be scarcely less important than the original trade in meat.

*Manufactures, &c.*—Most of the industries of the United States are protected by a very high duty on imported articles—a policy regarded by many enlightened Americans as unwise and pernicious. The high rate of wages prevalent and the scarcity of labour have stimulated invention. Mechanical contrivances of every sort are produced, and there is scarcely a purpose for which human hands have been ordinarily employed in which some ingenious attempt is not made to find a substitute in an efficient labour-saving machine.

Next to agricultural implements, the article in which Americans excel most is probably hydraulic machines. The first thing an American usually looks for in making his settlement is a water-privilege. To turn this water-privilege to advantage he must have hydraulic machinery; and hence, of all the countries in the world, America possesses the largest number of water-mills and hydraulic machines. They are used for nearly all purposes, but especially for grinding flour, sawing timber, working cotton mills, &c.

After the hydraulic machinery of America the printing press may be considered next in importance. The printing press of the United States is relatively so cheap that it can find its way into the most distant districts of the country, and there is scarcely a town of any importance in which there is not a daily paper. The production of paper for printing purposes has fully kept pace with the improvements in the printing machine, and their books of all kinds will now bear comparison with English publications of the same class. The American newspapers are, however, very inferior, both as regards paper and printing, to the better class of journals published in the United Kingdom. Printing in the United States is very largely done by female compositors. In New York one in six of the average number employed are women and girls. To a certain extent this is due to the use of machines for setting and distributing the types. In consequence of the absence of any copyright treaty between the United States and other countries, European standard works (but more especially English) are produced at very cheap rates, the publishers having to pay for nothing but materials and labour. Hitherto the Americans have always resisted any change in this respect, but such a system is so manifestly unsatisfactory and unfair to foreign authors that it can hardly be allowed to continue much longer.

The engineering manufactures of the United States have also become of considerable magnitude. The majority, if not all, of the locomotive and stationary steam-engines, of the engines used in mines, factories, mills, forges, &c., are now made at home. A certain proportion of machinery is still imported, but these machines are those only of the finer description.

Formerly the Americans were large importers of all sorts of manufactured leather articles, and especially of boots and shoes, but they now not only manufacture their own leather, but make all their own boots and shoes, and export them in large quantities. This branch of trade has attained its popularity and success entirely by the employment of machinery, which is now used in every department. The manufacture is chiefly carried on in large mills, some of which are worked by steam power.

Among other articles extensively manufactured in the United States are india-rubber goods, soap and candles, furniture, clocks, watches, and jewelry. Malt liquors have been introduced chiefly to suit the palate of the Germans, who form so large a portion of the population, but they are very inferior to those made in England. Spirits are made in very large quantities; and although the Americans are by no means an intemperate people, the enticing modes in which these spirits are presented (in the

shape of "cocktails," "juleps," "slings," and "twists"), whether as summer or winter beverages, induce them to consume very large quantities of highly intemperate liquids under an engaging form.

Though it scarcely comes under the head of a manufacture, ice is one of the most valuable articles in the States. Not only do they consume an immense quantity themselves, but it has also been reserved for the Americans to show the extent to which it can be carried as an article of commerce. They export it largely to all the southern ports of the Union, and also to the Spanish Main, South America, the West Indies, the East Indies, China, and Japan. Numerous companies and large numbers of vessels are engaged in the trade. The ice is taken from the fresh-water ponds situated at a great elevation above the sea. It is usually cut into blocks of about a foot thick, and is beautifully transparent and free from air cells. It is conveyed from the lakes to the store-houses by railway carriage. The storage and export are managed in such a way as to avoid waste, and the ice usually arrives at its destination in almost as solid a condition as when it was cut from its native pond.

*Condition of the Working Classes in the United States.*—The labouring classes may be said to embrace the entire American nation. Every man works for a living, follows a profession, or is engaged either in mercantile or industrial pursuits. The prosecution of the humblest calling acts as no bar to promotion in the social scale. The lowly citizen of to-day may aspire to presidential honours to-morrow. The steady influx of immigrants within the last twenty years has produced a marked effect on Americans in their choice of occupations, and has created a decided disinclination on their part to share in the rough toil of purely muscular labour in which the newly arrived foreigner is ready to engage. The American system of common school education has elevated the moral standard of the native working man, and has disposed him to prefer those occupations in which the exercise of the brain is in greater demand than that of the hand. His chief object of ambition is to attain to the position of a master workman, or in the parlance of the country, to become a "boss," or to obtain the situation of clerk in an office, or of an assistant in a shop, and rather than engage in work which he may deem derogatory to his moral culture he will follow the setting sun and settle on the public lands of the country, which the national government offers at almost nominal prices to any man who will cultivate them. Nor are the labouring capacities of the nation likely to be perceptibly strained for want of hands so long as the tide of emigration flows to the shores of America, or so long as native ingenuity maintains its present high standard of merit in the invention of labour-saving machinery. The excellent work, however, that was formerly performed by that class of smart educated young Americans who brought such varied intelligence to bear on anything they undertook is met with no more. A love of change and a constant pursuit of fresh fields of industry have taken possession of the mind of American operatives, and a spirit of restlessness is noted in the working community that has sensibly affected the former reputation it enjoyed for mechanical skill. The system of apprenticeship, moreover, has almost entirely disappeared; and Americans in general appear to begrudge the time necessary to make themselves thoroughly acquainted with the details of a business, and even those who have learned one are very rarely found to follow it up. The consequence has been that foreign is every day replacing native skilled labour. Indeed, the great number of foreign workmen employed in all the branches of American industries is very remarkable. Nearly all the hands at present in American cotton, woollen, and worsted mills, and in the foundries and rolling-mills of the country, are of recent foreign ex-

traction. Of the 35,000 miners engaged in the Pennsylvania coal districts, but few will be found who are not English, Welsh, or Irish. The largest proportion of manual work performed on railways and canals falls to the lot of Irishmen; and in the clothing trades established in the great cities of the Union the German element preponderates, while the comparatively few Frenchmen in the country are met with in the barbers' shops. It is a common remark in the United States that foreign workmen who come to that country seldom return to their native land with the intention, at least, of permanently residing there; and the inference is drawn that the prosperity of the artisan class in America is superior to that abroad. To a certain extent this may be true, although it must be admitted that the high cost of living and other circumstances very seriously affect the interest of the working community. It is, moreover, reasonable to suppose that a residence of a few years in the United States, where the principle of equality is carried out to so high a degree, will often unfit a man belonging to the artisan classes for living in the old countries of Europe, where the relative positions of social life are so strictly defined, and, as a rule, so rigorously enforced, and where the accident of birth is held of such account. Married and single men, be they of sober and active habits, find ample opportunities for improving their condition by emigrating to the United States; and the peculiar educational advantages to be derived by the working classes in it cannot be overrated. Every man, woman, and child has the means at his door of acquiring gratis an excellent course of instruction. The exercise of electoral privileges invests the working man in America with an amount of consideration which he might perhaps not otherwise command; and to no quarter of the globe can a man turn with so reasonable a chance of finding work as to the United States of America: nevertheless, let no man unadvisedly undertake so grave a step as expatriation, or forego the enjoyment, if in possession of it, of steady employment in the Old World for any prospective advantages to be derived in the New. The fortunes of the respective branches of American manufactures are at the best of a fluctuating character; and an over-supply of any particular commodity, or an unforeseen manœuvre on the part of trades' unionists, may at any time produce a catastrophe, the evil effects of which are sure to fall on the working man.

Trades unions, though still inferior in numbers and organization to those in Great Britain, are rapidly being consolidated into a large and powerful interest in the United States. They exist almost universally among the different classes of skilled artisans in the State of New York. The prescriptive nature of American trades unions is very formidable. It places restrictions on the number of apprentices to be engaged, it seeks to proscribe the employment of negroes, and sometimes it attempts to shackle the free movement of capital which has been embarked in costly industrial undertakings, in which the workmen have invested nothing. There have already been several severe strikes; and as the manufacturing and most important industries in the country are being gradually concentrated into the hands of large capitalists and powerful corporations, it is likely, unless wiser counsels prevail, that the struggle between capital and labour, in its associated capacity, will be a long and disastrous one, unless it can be prevented by co-operation, the advantages of which are being more and more recognized. The usual hours of labour in the United States are ten a day. In the government workshops, however, eight hours were constituted (by Act of Congress, approved 25th of June, 1868) a legal day's work without a corresponding reduction of pay. This change in the hours of labour was dictated by political motives, and is not generally considered to have worked advantageously. It has been the means of creating con-

siderable jealousy and ill-feeling among workmen, and of imposing a heavy percentage on all work performed in government workshops. Co-operative labour unions and clubs have repeatedly attempted to enforce the eight-hour rule upon employers, but without success. Some of these unions have, from time to time, imposed the rule upon their members, but as it has had the effect of reducing their wages in a proportionate degree, those trades which have made the attempt have one after another abandoned it rather than suffer the consequent diminution of their regular pay. When the agitation in favour of an eight-hour day first began in Buffalo, some of the large manufacturers anticipated difficulty with their workmen by substituting payment by the hour, at the rate of one-tenth of the ordinary wage, for payment by the day. The nature of the engagements of operatives vary with the character of the labour employed. Artisans in cities are usually engaged by the day, and in the country by the month. Written agreements or contracts are rare. In some parts of the state of New York wages are paid weekly, and in a few instances every fortnight. Engagements are, as a rule, made by the day, and the workman may at any time either receive his discharge or change his master. In large establishments where a steady business is done, a week's notice is generally expected on either side, but cannot be enforced. The labouring classes in the United States are, as a rule, exceedingly well lodged, more particularly in the rural districts, where they usually inhabit small wooden houses, which are admirably adapted to the climate, containing from four to five good rooms, and a small plot of ground attached. The small suburban cottages are generally inhabited by the skilled artisan, who, owing to the liberal remuneration received for his labour, is able to bear the expense of a daily railway or steamboat journey into the neighbouring town, where his employment is found. The quantity of land occupied by this class is frequently not more than what is termed a single "lot," measuring 25 by 100 feet. This, if not actually owned by the occupant, has been taken by him from the original proprietor under an agreement that it shall be paid for by periodical payments. In this manner an artisan of the better class is able in a very few years to become the absolute proprietor of his small home. The taxes imposed upon this class of proprietors are exceedingly small, and their dwellings once acquired they begin to lay by money. Unskilled labourers, as a rule, are not sufficiently well paid to allow them to reside at any great distance from their work, and it is, therefore, this class which is confined to the towns themselves. Added to this a large portion of the better class of artisans remain from choice within the town, and many are detained in them by the nature of their employment. These are the classes inhabiting "tenement houses," which are large structures of from three to six storeys in height, and containing, on the average, from seven to twelve families. Each family occupies from one to four rooms. The general rule is found to give two rooms to each family. The houses are almost all built upon the same plan. A gloomy stairway in the centre of the building, upon which all the rooms open, and a small paved court, a few feet square, at the rear. The plan of this class of building is considered objectionable, as not being conducive to privacy or domesticity. Single men generally live in boarding-houses, and pay on an average from 12s. to 18s. a week, and single women from 9s. to 13s. 6d. Board in country towns is proportionally cheaper.

**Fisheries.**—The fisheries of the United States are of great value. Notwithstanding the extraordinary temptations to engage in agriculture afforded by the cheapness and facility of obtaining land, the Americans have from the earliest period been distinguished for their skill in fisheries and navigation, and by the vigour and success with which they have pursued those branches of industry.

They commenced the whale fishery as early as 1690, and for about fifty years found an ample supply of fish on their own shores; but the whale having then abandoned them, the American navigators entered with extraordinary ardour into the fisheries carried on in the Northern and Southern Oceans. The other principal sea fisheries are those of the cod and mackerel, both of which are carried on with great vigour. The total number of hands employed in all the fisheries of the United States is over 80,000, and the estimated annual produce is valued at 100,000,000 dollars.

*Shipping.*—The people of the United States derive a great advantage from the extent and nature of their sea-board. Their whole Atlantic coast-line from Maine to Florida presents an infinite variety of bays, inlets, river entrances, and harbours. Many of them are capable of accommodating the largest class of vessels. In the whole world there are comparatively few ports which a ship having so great a draught of water as the *Great Eastern* is able to enter, or in which she can lie securely. But she can not only enter the Bay of New York, but can lie close up to the very shore of the city. On the south the Americans have also a number of fine harbours in the Gulf of Mexico; and their Pacific coast-line, though not so well indented as that of the Atlantic, affords, in addition to the great bay of San Francisco, several excellent resorts for shipping, especially in the Columbia River in Oregon and in Puget's Sound. Nor can it be said that even on their northern boundary they are without a coast-line; for the great lakes which form that boundary afford an extent of navigation almost equal to that of an ocean, and are navigated by sailing craft and steamers to an extent but little inferior to that of the sea-board itself.

In addition to their coast-lines, lakes, and shores, the country has the great advantage of being permeated by a number of most important navigable rivers. The state of Maine is traversed by the Kennebec; Vermont, New Hampshire, Massachusetts, and Connecticut, by the Connecticut River; New York, by the Hudson and its branches; Pennsylvania, by the Delaware and Schuylkill; Maryland, by the Susquehanna—all flowing from west to east. All the southern states, except Florida, which, with a double coast-line, scarcely requires inland navigation, have rivers which are navigable for larger or smaller craft. Nor is this great advantage confined to the northern or southern states. The great river Mississippi permeates the very centre of the continent of America, and by means of a canal from the Mississippi to Chicago, which permits the passage of large shipping, absolutely carries the produce of the northern lakes directly to the Gulf of Mexico. The Mississippi, in its course to the ocean, of itself affords navigation to no less than ten great states—Minnesota, Wisconsin, Iowa, Illinois, Missouri, Kentucky, Arkansas, Tennessee, Mississippi, and Louisiana. Its branches, the Missouri River, the Platte, the Ohio, the Wabash, the Arkansas River, the Red River, and others, afford opportunities for navigation even into the most distant regions and territories. The inland navigation of America is indeed quite as important as its coast-line; for by it the very heart of the continent is reached, and vast fields of produce are brought into direct communication with the sea-board and the ports of export, and it is something for the people of the United States to boast of that the whole of these waters are navigated by vessels of their own construction.

Previous to the beginning of the Civil War there was a gradual, steady, and healthy increase of American ocean shipping—the increase between 1830 and 1840 being 60 per cent.; between 1840 and 1860, 75 per cent.; and between 1850 and 1860, 60 per cent. In 1860 the American tonnage reached its highest point. The decrease since that date is strikingly exhibited in the annexed table, which shows the amount of American and foreign tonnage

that entered at American ports from foreign countries during the years named:—

Year.	American Tonnage.	Foreign Tonnage.	Excess of American over Foreign.	Excess of Foreign over American.
1830	967,227	131,900	835,327	—
1840	1,576,946	712,363	864,583	—
1850	2,573,016	1,775,628	797,393	—
1860	5,921,285	2,853,911	3,067,374	—
1870	3,486,088	5,669,621	—	2,183,533
1886	3,231,573	11,914,043	—	8,682,470

Of the total exports and imports in 1886 only 16 per cent. was carried in vessels belonging to the United States.

*Commerce.*—The commerce of the British colonies which afterwards formed the United States, early attained a considerable magnitude. In 1700 the exports of New England, New York, Pennsylvania, Virginia, Maryland, and Carolina amounted to about £395,000, and their imports to £344,000. In 1750 the exports of these colonies had risen to £813,000, and their imports to £1,312,000. In 1775 the exports were £1,920,000, while the imports, which in the previous year (1774) were £2,692,000, fell off under the prospect of the coming war to £196,000, and in 1776 to £55,400. During the war, and until the adoption of the constitution, trade languished, and commerce was to a considerable extent suspended, owing to the jealousies of foreign states and the rivalry of the several members of the confederation. After the re-organization of the government under the constitution in 1789, it speedily attained respectable proportions. The tonnage, which in 1792 was 564,437, had increased in 1801 to 1,033,219; the imports, which in 1792 were 31,500,000 dollars, were 111,363,511 dollars in 1801; and the exports had risen during the same period from 20,753,098 dollars to 94,115,925 dollars. In 1807 the tonnage was 1,268,548, the imports 138,500,000 dollars, and the exports 108,313,150 dollars. At this point American commerce received a blow from which it did not recover for years. The Orders in Council of the British government, followed as they were by the Berlin and Milan Decrees of Napoleon, and by their own Embargo Act in 1807, produced a terrible stagnation in the United States commerce; and though the amount of tonnage did not vary materially for the next fifteen years, the imports fell off in 1808 to 56,990,000 dollars, and the exports to 22,430,960 dollars. The war of 1812-15 furnished employment to some of the vessels which would otherwise have rotted at their wharfs, and led to the building of some war vessels and fast-sailing privateers; but the commerce of the country continued to decline, till in 1814 it had fallen to 12,965,000 dollars imports, and 6,927,441 dollars exports. The close of the war gave an extraordinary impulse to trade, and in 1815 the imports reached 113,041,274 dollars, while in 1816 they rose to 147,103,000 dollars; the exports of these two years were 52,557,753 dollars and 81,820,452 dollars. From this amount, which was excessive for the wants of the country at the time, there was a falling off the next year to 99,250,000 dollars; and from that period to 1830, with the exception of 1818, the average of imports did not exceed 78,000,000 dollars, and the exports were of about the same amount. From 1831 to 1837 the imports and exports rapidly increased, the former being 189,980,035 dollars in 1836, and the latter 128,663,040 dollars. The revulsion of 1837, and the combined results of the bankrupt law, the change in the tariff, and the secondary effects of the great financial panic, reduced both imports and exports, which touched their lowest point in 1842. From just after that date, as will be seen by the annexed

table, the increase was gradual at first, but more rapid in the later years up to 1860, when the exports and imports together amounted to about £150,000,000 sterling. This was less than half that of the United Kingdom, which in the same year conducted an import and export business amounting to £375,000,000 sterling, a trade which has since been so much increased as to reach nearly £650,000,000 sterling. But except France, there is no other country which approaches the United States in the value of its trade.

The following table gives the value of the imports and exports from 1847 to 1886:—

Year.	Imports.	Exports.
	Dollars.	Dollars.
1847	146,545,638	158,648,622
1848	154,998,928	154,032,131
1849	147,851,439	145,755,820
1850	178,138,318	151,898,720
1851	216,224,932	218,388,011
1852	212,945,442	209,658,366
1853	167,978,647	230,976,157
1854	304,562,381	278,241,064
1855	261,468,520	275,156,846
1856	314,639,942	326,964,908
1857	360,890,141	362,960,682
1858	282,613,150	324,644,421
1859	338,765,130	356,789,462
1860	353,616,119	333,576,057
1861	289,310,542	219,553,833
1862	189,356,677	190,670,501
1863	243,335,815	203,964,417
1864	316,447,283	158,837,988
1865	238,745,580	166,029,303
1866	434,812,066	348,859,522
1867	395,761,096	294,506,141
1868	357,436,440	281,952,899
1869	417,506,379	286,117,697
1870	435,958,408	392,771,768
1871	520,223,684	412,820,178
1872	626,595,077	444,177,586
1873	642,136,210	522,479,922
1874	567,406,342	586,283,010
1875	533,005,436	513,412,711
1876	460,741,190	540,384,671
1877	451,323,126	602,475,220
1878	437,051,532	694,865,766
1879	445,777,775	711,637,393
1880	667,953,302	823,946,353
1881	642,664,628	883,925,947
1882	724,639,574	733,239,732
1883	723,180,914	804,223,632
1884	667,697,693	724,964,852
1885	577,527,329	726,682,946
1886	635,136,036	665,964,529

Having regard to the United States tariff, which imposes duties upon foreign manufactures equal in many cases to the original cost of their production, it seems at first sight a little strange that any foreign-made goods at all can be taken into the States and sold at a profit, especially when it is remembered that in Massachusetts and many other parts of the Union there have sprung up numerous manufacturing on a most gigantic scale. The fact is, however, labour stands at so high a price, that unless goods can be manufactured rapidly by machinery it pays better to import them and pay the heavy duties.

The value of the chief exports of domestic merchandise for 1886 was as follows:—

	Dollars.
Cotton, . . . . .	205,086,742
Cotton manufactures, . . . . .	13,959,934
Wheat, . . . . .	50,262,715
Wheat-flour, . . . . .	38,442,955
Maize, . . . . .	31,730,922
Meat, eggs, butter, and other provisions, . . . . .	90,625,216
Petroleum, . . . . .	50,199,844
Tobacco, . . . . .	80,424,908
Wood and its manufactures, . . . . .	20,643,390
Iron and steel manufactures and bars, . . . . .	15,755,400
Cattle, . . . . .	10,958,954
Sugar and molasses, . . . . .	12,191,766
Copper and manufactures of, . . . . .	5,671,748
Leather and manufactures of, . . . . .	8,737,682
Oil cake, . . . . .	7,053,714
Furs, fur skins, hides and skins, . . . . .	4,195,027
Mineral oils (crude), . . . . .	5,859,577
Spirits, . . . . .	2,745,514
Fish, . . . . .	4,208,901
Chemicals, . . . . .	5,313,468
Coal, . . . . .	4,188,530
Wool and manufactures of, . . . . .	1,129,907

The following table classifies the exports of home produce for 1886 according to their origin:—

Products of	1886.	
	Value.	Per cent. of Total.
	Dollars.	
Agriculture, . . . . .	484,954,595	72.88
Manufactures, . . . . .	106,419,692	15.98
Mining, . . . . .	57,994,553	8.71
The forest, . . . . .	6,743,727	1.01
The fisheries, . . . . .	5,138,806	.77
All others, . . . . .	4,713,156	.71
Total, . . . . .	665,964,529	100.00

The leading imports into the United States were in 1886:—

	Dollars.
Sugar, molasses, &c., . . . . .	77,218,135
Wool and woollen goods, . . . . .	58,167,400
Chemicals, . . . . .	37,813,325
Coffee, . . . . .	42,672,937
Iron and steel manufactures, . . . . .	38,840,111
Flax, hemp, jute, and manufactures, . . . . .	30,923,502
Cotton goods, . . . . .	30,381,774
Hides, furs, &c., . . . . .	35,727,701
Silk goods, . . . . .	27,957,939
Silk, raw, and cocoons, . . . . .	18,277,216
Tea, . . . . .	16,020,383
Fruits and nuts, . . . . .	17,318,259
Wood and manufactures, . . . . .	12,222,852
Leather and manufactures, . . . . .	11,850,708
Tobacco and manufactures, . . . . .	11,212,088
India-rubber and gutta-percha, . . . . .	12,121,724
Paper and manufactures, . . . . .	7,033,773
Jewelry and precious stones, . . . . .	9,015,365
Horses and cattle, . . . . .	6,940,026
Barley, . . . . .	7,177,887
Wines, . . . . .	6,940,041
Glass and glassware, . . . . .	6,338,097

The customs duties amounted to 192,905,023 dollars, or over £38,000,000.



The following table shows for the year 1886 the value of the exports of domestic merchandise to and the imports from the following countries, according to the United States returns:—

	Home Exports to	Imports from
	Dollars.	Dollars.
Great Britain and Ireland, . . . . .	844,927,973	154,254,054
Germany, . . . . .	60,923,857	69,154,997
France, . . . . .	40,006,096	63,417,430
British North America, . . . . .	31,953,124	37,496,338
Belgium, . . . . .	22,613,399	9,178,513
Netherlands, . . . . .	14,586,664	8,523,846
Italy, . . . . .	13,048,846	16,870,686
Spain, . . . . .	13,047,762	5,930,202
Australasia, . . . . .	10,981,915	3,859,360
Cuba, . . . . .	10,020,879	51,110,780
Russia, . . . . .	9,857,017	3,283,127
China, . . . . .	7,518,277	18,972,963
British West Indies, . . . . .	7,113,699	9,853,680
Mexico, . . . . .	6,856,077	10,687,972
Brazil, . . . . .	6,480,738	41,907,532
United States of Colombia, . . . . .	5,294,798	3,008,921
British East Indies, . . . . .	4,350,141	17,247,825
Argentine Republic, . . . . .	4,331,770	5,022,346
Portugal, . . . . .	4,306,205	1,341,167
Hong-Kong, . . . . .	4,044,384	1,072,459
Japan, . . . . .	3,125,130	14,885,573
Denmark, . . . . .	2,915,003	432,020
Central America, . . . . .	2,422,171	5,915,413
Venezuela, . . . . .	2,695,488	5,791,621
Uruguay, . . . . .	1,110,545	4,925,848

Thus, in the year ending 1886, 51.79 per cent. of the domestic exports of the United States went to Great Britain alone, while 21.28 per cent. of the imports came from that country.

The commercial intercourse of the United States with Great Britain and Ireland, according to the Board of Trade returns, is shown in the subjoined table:—

Years.	Exports from the United States to Great Britain.	Imports of British Home Produce into the United States.
	£	£
1870	48,804,835	28,335,394
1871	61,134,463	31,227,701
1872	54,663,948	40,736,597
1873	71,471,493	33,574,664
1874	73,897,400	28,241,809
1875	69,590,054	25,062,226
1876	75,899,008	16,833,517
1877	77,825,973	16,376,814
1878	89,146,170	14,552,076
1879	91,818,295	20,321,990
1880	107,081,260	30,855,871
1881	103,207,829	29,796,298
1882	88,352,613	30,970,147
1883	99,238,960	27,372,968
1884	86,278,541	24,426,636
1885	86,478,813	21,993,821
1886	81,600,197	26,824,896

In addition to the British home produce exported to the United States, a large quantity of foreign and colonial produce is also sent from this country, and the value of the total exports from Great Britain to the United States in 1884 was £32,738,533; in 1885, £31,094,589; and in 1886, £37,607,805.

The quantities and values of the chief articles in 1886 were as follows:—

#### IMPORTS FROM THE UNITED STATES INTO THE UNITED KINGDOM.

	Quantity.	Value.
		£
Oxen and bulls, . . . . .	113,756	2,270,831
Bacon and hams, . . cwt.	3,430,087	6,314,321
Beef, fresh, . . . . .	762,226	1,767,808
Cheese, . . . . .	856,109	1,837,487
Corn—wheat, . . . . .	24,648,581	9,518,931
Maize or Indian corn, . .	16,701,472	4,093,821
Wheat meal and flour, . .	11,425,251	6,171,863
Cotton, raw, . . . . .	11,540,508	28,555,402
Lard, . . . . .	796,724	1,330,467
Leather, . . . . .	27,211,573	1,419,477
Oil-seed cake, . . . tons.	236,098	1,514,573
Petroleum, . . . . .	68,084,623	1,993,873
Sugar, refined, . . . cwt.	1,423,323	1,229,809
Tobacco, unmanufact. lbs.	70,458,667	2,019,600

#### EXPORTS FROM THE UNITED KINGDOM TO THE UNITED STATES.

##### *Produce and Manufactures of the United Kingdom.*

	Quantity.	Value.
		£
Alkali, . . . . .	3,455,700	1,006,723
Cottons, . . . . .	45,251,600	1,148,955
Cottons, . . . . .	—	1,151,643
Earthen and china ware, .	—	778,322
Jute, manufactures, . . .	—	—
“ piece goods, . . . yds.	119,464,700	905,737
Linens, . . . . .	—	2,526,186
Machinery and mill work, .	—	515,061
Metals, wrought and un-	808,857	5,780,580
wrought, . . . . . tons		
Silk manufactures, . . . .	—	808,416
Skins and furs of all sorts,	—	615,470
Woolens, . . . . .	53,189,300	3,880,976

##### *Foreign and Colonial Produce and Manufactures.*

	Quantity.	Value.
		£
Caoutchouc, . . . . .	51,766	607,270
Indigo, . . . . .	11,001	202,778
Hair of all sorts, . . . .	—	333,889
Hemp, dressed and un-	117,583	171,787
dressed, . . . . .		
Hides, raw, . . . . .	217,554	615,012
Leather, dressed and un-	3,660,140	292,439
dressed, . . . . . lbs.		
Metal, iron bars, &c., tons	29,409	278,019
Metals, iron and steel manu-	—	—
factures, . . . . .		
Unenumerated, . . . . .	176,681	115,148
Metals, tin in blocks, in-	190,721	927,851
gots, bars, or slabs, cwt.		
Precious stones, unset, . .	—	299,663
Rags and other materials	33,991	346,832
for making paper, tons		
Skins (goat), undressed, No.	4,095,936	317,678
Spices of all sorts, . . lbs.	10,291,442	317,340
Tea, . . . . .	4,075,290	207,572
Wool—sheep and lambs, . .	65,136,998	2,271,766

*Internal Trade.*—Large as is the export and import trade of the United States, it is nothing in comparison with her internal commerce, which is very much facilitated by the perfect freedom of trade which exists between all the states and territories. The distances in America are so great, the region of production lies, in many cases, so far from the field of consumption, that the internal trade and traffic of the country must be necessarily a business, not only of vast importance in itself, but of importance enlarging with the rapid increase of population, the still more rapid development of the resources of the country, and the extended and extending field over which the population is spread, and from which these resources are drawn. In fact, the inland trade of the United States may be considered almost as various as that of Great Britain with her colonies. It is astonishing to observe the vast quantities of produce in course of transit throughout the country. Huge steamboats on the Mississippi and Alabama are loaded to the water's edge with bales of cotton. Those on the Ohio are burdened with barrels of pork and thousands of hams. "Propellers" on the lakes are filled with the finest wheat from Wisconsin and Michigan. Canal boats in New York and Pennsylvania are deeply laden with flour. Railway waggons are filled with merchandise; and locomotives struggle in the western wilds to drag trains richly freighted with the productions of every country under the sun. The United States reminds one sometimes of a great ant-hill, where every member of the community is either busy carrying a burden along a beaten pathway, or hastening away in search of new stores to increase the national prosperity.

*Railroads.*—Railroads in the United States may be said to be contemporaneous with those in England. Before steam power was applied to railway lines in that country. Iron tracks, on which vehicles were drawn by horse-power, were in use from granite and coal quarries to ports of debarkation. In Quincy, Massachusetts, one of these, terminating at the quarries with a self-acting incline plane, was begun in 1826 and opened in 1827, and in the latter year similar lines were constructed in Pennsylvania. They were, however, very imperfect. The first locomotive which was ever seen in America was imported from Mr. Stephenson's factory at Newcastle-on-Tyne, in 1829, and was for some time exhibited as a curiosity in New York. The first locomotive engine used in the States was constructed by Messrs. Foster, Rastrick, & Co., of Stourbridge, in the latter part of the same year. In 1830, no doubt from these models, a locomotive engine was made in New York by the Americans themselves.

Of the more considerable railway enterprises of the country, the first was a portion of the now Baltimore and Ohio Railroad, which was opened in 1830. Although the traffic was great, an engine appears to have been only partially worked, the trains having also been moved by horses.

In 1830 the Hudson and Mohawk Railroad, from Albany to Schenectady, was commenced, and in 1832 a locomotive with a load of 8 tons travelled on it at the rate of 30 miles an hour. In 1831 twelve different railroad companies were incorporated; and from this time railroad enterprises were rapidly multiplied.

From the first the American people favoured railroad construction, and afforded every possible facility for it. In fact, every one there felt at once what every Englishman has experienced at last, that the construction of a railroad through his property, or to the city, town, or village he inhabited, was a source of prosperity and wealth, not only to the district in which he resided, but to himself personally. Thus, as a rule, nothing has been easier than to obtain from the legislative authority of a state in America a concession, or as it is there styled, a "charter," to lay down a road. The land, in many cases, especially where it be-

longed to the public, has been freely given for the line; in other cases, where landed proprietors were affected, comparatively small compensations have sufficed to satisfy their claims. In a recent year no less than 2,000,000 acres were given by the state for railroad purposes, and it has been calculated that the total amount of land thus voted as "approvals" for railways is more than equal to the area of the whole original thirteen states of the Union.

The outlay upon the American lines has been from £8700 up to £15,000 per mile, while the average cost in Great Britain has been nearly £40,000 per mile. In this estimate of cost we have, of course, to consider the relative character of the lines. The American lines are almost invariably single, while the English railways are mostly double lines. In other respects the American railroads are, as a rule, very inferior to the English. Their earthworks are, for the most part, of a very simple character. In fact, from the generally level surfaces through which they are made (in the prairie districts especially), little has been done but to lay out the track. The timber for the sleepers has been obtained from the roadside, or from the woods in the immediate neighbourhood. The supply has usually been abundant; and it has immensely contributed to the economic construction of the road, enabling the constructors to lay down sleepers at much more frequent intervals than is usually done in Europe. The rails have been usually obtained from England, Wales, or Scotland, and in many cases the price of the iron has formed, in America, the largest proportion of the cost of the construction of the lines. The rails are generally too light, and the permanent way is but ill drained and imperfectly ballasted.

There is very little tunnelling on the American railways, and most of the bridges and viaducts are constructed on wooden framework in a very inexpensive manner.

The progress of railways in America has been rapid.\* In 1830 there were only 41 miles open; in 1840 there were 2818; in 1850, 9021; in 1860, 30,635; in 1870, 53,600; in 1880, 91,147; and in 1886, 128,967. The amount of capital invested in American railroads amounts to nearly £1,600,000,000. The gross earnings are £153,000,000 per annum, and the net earnings £53,000,000, or an average of only about  $3\frac{1}{2}$  per cent. on the outlay. The United States possesses the longest continuous line in the world—the Union Pacific, from New York to San Francisco, which was opened in 1869. It is 3200 miles in length—or 400 miles more than the distance between Liverpool and New York—and the journey occupies six days. Considering both the distance which it traverses, and the difficulties of nature with which it had to contend, it is no exaggeration to pronounce the line the greatest undertaking of the kind which has been completed since the railway locomotive was invented. Of the 3200 miles, 1800, from New York to Omaha on the Missouri, were open before the Pacific line was commenced, and regular railway communication thus existed half-way across the continent. This, however, was only in the "settled" districts of the Union, and the route between there and California lay through the vast wild solitudes of Nevada, Colorado, and Utah, and thence over the Rocky Mountains; and at only one spot, the Mormon city of Salt Lake, was there a settlement. On the plains, and for long distances, the mere engineering was comparatively easy; but during the first progress of the work the Indians, with an instinctive dread of the undertaking, constantly attacked the labourers and wrecked the trains, until it was as much as 10,000 workmen, supported by a large body of troops, could do to preserve the works from destruction. The line was commenced in January, 1866, and during the first year only 300 miles had been completed; but the works were afterwards pushed on with marvellous vigour, and the whole line was opened for traffic in June, 1869. The line was made and is owned by two distinct com-



panies. The Central Pacific possesses the western portion, which consists of 690 miles; the remainder, or eastern portion, belongs to the Union Pacific Company. The point of junction of the two lines is a place called Promontory, situated near the great Salt Lake of Utah. It was evident from the first, however, that private companies alone could not accomplish the design, and the government therefore gave authority to issue heavy mortgage bonds, made the necessary grants of public lands along the lines, provided for the making of convenient branches, connecting the chief settlements of Kansas and Southern Colorado with the main line, and reserved for itself postal and military rights on the road. It granted also certain subsidies to the companies; agreed to provide 16,000 dollars for each mile laid down between the Missouri and the mountains; and, when the construction became more difficult, by reason of the necessity of ascending the spurs and penetrating the passes, 32,000 and 48,000 dollars per mile. These subsidies were paid in United States 6 per cent. bonds, and altogether about £10,000,000 sterling was given by the government in this way. The Central Pacific Company worked from the west towards the east, while the Union Pacific worked from east to west. Promontory was the point at which the lines happened to meet. By far the more difficult portion of the work was that which was performed by the Central Pacific. They had to ascend the sierras of California, while they worked under the pecuniary disadvantage of having to bring their materials round by sea, or across the Isthmus of Panama from the eastern states. The greater part of the Central Pacific Railway route was made by Chinese labour. The highest point of the line is about 8000 feet above the sea, but in only one place does the gradient exceed 90 feet per mile.

The cost of working the American lines is more than double that in England, being at the rate of nearly 72*d.* or 6*s.* per train mile, against 31*d.* or 2*s.* 7*d.* This is chiefly caused by the imperfect way in which the American lines were first made, and, consequently, the great wear and tear on them, and partly by the high price of labour. But the greatest difference of all in the item of cost is in the matter of fuel; the cost of which, in America, is nearly 11*d.* per mile travelled by the trains, while in England it is only 1½*d.* The charges are generally low, both for passengers and goods, and the rates are so simple and well understood that the sale of tickets is by no means confined, as in the United Kingdom, to railway stations, but they may be obtained at numerous trading stores in the towns along the line of route.

In some cases American railways have proved fairly successful as financial investments, but this can only be said of those in the more populous districts of the country. There is an enormous mileage, and a necessarily increasing one, traversing thinly populated country, and though the benefit conferred by such lines in developing the resources of the States is unquestionable, dividends are seldom paid by them. There has, indeed, in many cases been actual loss on these railways, involving ultimate insolvency and foreclosure.

American railways would probably make much larger profits were they to adopt a system of "second-class" cars; thereby affording travellers an opportunity of consulting their convenience and their pockets, by travelling either expensively or cheaply as they thought proper. The present car system is bad, both for the public and the companies, in an economic point of view. Uniformity of class means uniformity of rate; and while some American companies are precluded under the powers of their charters from accepting what the more opulent class of travellers would willingly pay for superior accommodation, they must of necessity keep up the price to the more needy classes, who would be quite ready to set diminished charges against

moderate comfort and any supposed admission of social inferiority involved in travelling in carriages of a cheaper class.

The great distances over which it is necessary for Americans to travel has induced attention on the part of the railway administration to the conveniences for long journeys. For instance, all the chief lines have attached to their night trains "sleeping cars;" which are so arranged that while serving the purpose of a comfortable railway carriage in the daytime, they can at night be converted into as comfortable sleeping chambers. Good beds are made up by the train attendant, and the occupants can traverse from 160 to 240 miles of their journey insensible of all the inconveniences of a night journey. Washing-rooms and other essentials of a long journey are also provided in the sleeping cars, so that the passengers can make their toilet independent of the stoppages of the train. These sleeping cars have been introduced into Great Britain and the Continent. In addition to the sleeping cars, eating or hotel cars are now provided on the Pacific and other long lines.

High speeds are not generally in favour on American lines; indeed, as a rule, their condition does not admit of them. The rates of the express trains between New York and Boston do not exceed 30 miles per hour, which is about the average of the leading lines. As regards loads, their goods trains (or freight trains, as they are called in America) are, as a rule, heavier than those in England; but they are drawn generally by lighter engines, which accounts for the deficiency of speed.

*Telegraphs.*—About the year 1832 Professor S. F. B. Morse first conceived the idea of an electro-magnetic telegraph, and in 1844 he erected, between Washington and Baltimore, a distance of about 40 miles, the first line established in the United States or in the world. This line was extended northward through Philadelphia and New York to Boston in 1845. The telegraphic wires now in operation form a network over the length and breadth of the land, from the Great Lakes to the Gulf of Mexico, and from the Atlantic to the shores of the Pacific. They also connect with the telegraph wires in the British provinces, where they have received a remarkable development, and are now extended from Prince Edward's Island to St. John, in Newfoundland, the most eastern point of America, and thence, by means of several submarine cables, with Great Britain and the rest of Europe. The telegraphs of the United States are nearly all in the hands of the Western Union Telegraph Company, which has 150,000 miles of line, 470,000 miles of wire, and 14,500 offices. There are over 320,000 telephones in use and about 800 telephone exchanges.

*Post-Office.*—The postal arrangements in the United States, although very good for a comparatively new country, and one in the course of rapid development, cannot yet be compared with those of the United Kingdom. The number of letters sent in the year 1886 was 1,000,000,000. The system of uniformity of postage is carried out in the United States—a letter being sent to any part for three cents (1½*d.*) The enormous distance which the mails have to travel, the vast amount of territory which is still waste, and the paucity of towns, have hitherto always caused the post-office expenditure to be greater than its income. The loss in 1886 was £1,600,000.

*Money, Weights, and Measures.*—The coins most in use in the United States are—the dollar (average rate of exchange, 4*s.*); the half-eagle, five dollars; the eagle, ten dollars; the double eagle, twenty dollars. There are also half and quarter dollars, dimes or ten cents, half-dimes, and the nickel cent or one-hundredth part of a dollar. The ordinary English weights and measures are used, with the exception that a quintal of 100 lbs. is generally employed instead of a hundredweight.

*Population and Immigration.*—The subjoined table gives the area and population of each of the states, of the nine territories of the Union, &c. :—

States and Territories.	Area, Eng. sq. miles.	Population in 1870.	Population in 1880.
<b>States :—</b>			
Alabama, . . .	51,540	996,992	1,262,505
Arkansas, . . .	53,045	484,471	802,525
California, . . .	155,980	560,247	864,694
Colorado, . . .	103,645	39,864	194,327
Connecticut, . . .	4,845	537,454	622,700
Delaware, . . .	1,960	125,015	146,608
Florida, . . .	54,240	187,748	269,493
Georgia, . . .	58,980	1,184,109	1,542,180
Illinois, . . .	56,000	2,539,891	3,077,871
Indiana, . . .	35,910	1,680,637	1,978,301
Iowa, . . .	55,475	1,194,020	1,624,615
Kansas, . . .	81,700	364,399	996,096
Kentucky, . . .	40,000	1,321,011	1,648,690
Louisiana, . . .	45,420	726,915	939,946
Maine, . . .	29,890	626,915	648,936
Maryland, . . .	9,860	780,894	984,943
Massachusetts, . . .	8,040	1,457,351	1,783,085
Michigan, . . .	57,430	1,184,059	1,636,937
Minnesota, . . .	79,205	439,706	780,773
Mississippi, . . .	46,340	827,922	1,131,597
Missouri, . . .	68,735	1,721,295	2,168,880
Nebraska, . . .	76,185	122,993	452,402
Nevada, . . .	109,740	42,491	62,266
New Hampshire, . . .	9,005	318,300	346,991
New Jersey, . . .	7,455	906,096	1,131,116
New York, . . .	47,620	4,382,759	5,082,871
North Carolina, . . .	48,580	1,071,361	1,399,750
Ohio, . . .	40,760	2,665,260	3,198,062
Oregon, . . .	94,560	90,923	174,768
Pennsylvania, . . .	41,985	3,521,951	4,282,891
Rhode Island, . . .	1,085	217,353	276,531
South Carolina, . . .	39,170	705,606	995,577
Tennessee, . . .	41,750	1,258,520	1,542,359
Texas, . . .	262,290	818,579	1,591,749
Vermont, . . .	9,135	330,551	332,286
Virginia, . . .	40,125	1,225,163	1,512,565
West Virginia, . . .	24,615	442,014	618,457
Wisconsin, . . .	54,450	1,054,670	1,315,497
<b>Total States,</b>	<b>2,940,780</b>	<b>38,155,505</b>	<b>49,371,310</b>
<b>Territories :—</b>			
Arizona, . . .	112,920	9,658	40,440
Columbia District, . . .	60	131,700	177,621
Dakota, . . .	147,700	14,181	135,178
Idaho, . . .	84,290	14,999	32,610
Montana, . . .	145,310	20,595	39,159
New Mexico, . . .	122,460	91,874	119,565
Utah, . . .	82,190	86,786	143,963
Washington, . . .	66,880	23,955	75,116
Wyoming, . . .	97,575	9,118	20,789
<b>Total Territories,</b>	<b>859,385</b>	<b>402,866</b>	<b>784,413</b>
<b>Total States and Territories,</b>	<b>2,900,165</b>	<b>38,558,371</b>	<b>50,155,783</b>
Alaska, . . .	531,409	70,641	33,426
Indian Territory, . . .	69,830	—	79,024
Other Agency Indians, . . .	—	—	164,563
Outside Indians, . . .	—	—	61,321
<b>Total, United States,</b>	<b>3,501,404</b>	<b>38,629,012</b>	<b>50,497,657</b>

At the date of the census of 1870 there were only thirty-seven states, but Colorado was subsequently admitted, and its area and population are therefore here included among the states composing the Union.

The average density of the population of the states and territories in 1870 was 13.30 per square mile, and in 1880 it was 17.29. The total increase in ten years in the states and territories was 11,597,412, or at the rate of 3 per cent. per annum during the decennial period. As regards sex, the total population of the states and territories at the census of 1880 comprised 25,518,820 males and 24,636,963 females. In the Mormon territory of Utah there were 74,509 males and 69,454 females at the census of 1880.

The population of the United States was as follows at each of the ten enumerations from 1790 to 1880 :—

Years.	White.	Free coloured.	Slave.	Total.
1790	3,172,006	59,527	697,681	3,929,214
1800	4,306,446	108,435	893,602	5,308,483
1810	5,862,073	186,446	1,191,862	7,239,881
1820	7,862,166	233,634	1,538,022	9,633,822
1830	10,537,878	319,599	2,009,043	12,866,020
1840	14,195,805	386,293	2,487,355	17,069,453
1850	19,558,068	434,495	3,204,313	23,191,876
1860	26,922,537	488,070	3,953,760	31,364,367
1870	33,589,377	4,880,009	—	38,469,386
1880	3,402,970	6,580,793	—	49,983,763

These figures do not include Chinese (105,613) and Indians (339,098), whose numbers bring the whole population at census of 1880 up to 50,526,222, excluding the Indian territory and uncivilized Indians. In 1888 the total population was estimated at 58,000,000. The apparent enormous increase of the coloured population (which is not added to by immigration), at the rate of  $3\frac{1}{2}$  per cent. per annum by excess of births alone, is partly accounted for by the defective enumeration of 1870.

At the first census of the Union (in 1790) there existed only seventeen states, the largest of which, as then constituted, was Virginia, with a population of 717,610, and the smallest, Tennessee, with a population of 35,691. At the second census (in 1800) there were twenty states, the largest, Virginia, with a population of 880,200, and the smallest, Indiana, with 5641 inhabitants. Virginia still took the lead at the third census (in 1810), with a population of 974,601. At the fourth census (in 1820) there were twenty-seven states, New York standing first with 1,372,111, and Michigan last with 8765 inhabitants. All the succeeding enumerations gave the State of New York the first place. The sixth census (of 1840) included twenty-nine states. The seventh census (of 1850) added two territories, New Mexico and Utah, to thirty-three existing states. At the eighth census (of 1860) there were thirty-six states and six territories, while the ninth census included thirty-seven states and ten territories; the tenth, thirty-eight states and nine territories.

There were, in 1880, in the United States (including Alaska), 339,098 Indians. Of these there were 243,527 in the Indian Territory or attached to the Indian Agency, and 66,497 of outside or tax-paying Indians. There are about 8655 Indians in Alaska, most of the remaining population being Eskimos.

Although there are poor-laws in the states the statistics of pauperism, except for indoor paupers, are not recorded. The total number of indoor paupers in the census year (1880) was 67,067, in addition to whom 21,598 outdoor paupers were reported, but the latter figure is probably far below the truth. In 1880 there were 59,255 criminals in the prisons, only 5069 of whom were women.

Of the population of the states and territories in 1880,

43,475,840 were natives, and 6,679,943 foreign born. Including the latter there were 12,978,894 residents of foreign-born parentage. Of this total 4,529,523 had Irish fathers, and 4,444,421 Irish mothers; 4,883,842 German fathers, and 4,557,629 German mothers; 2,039,808 with fathers, and 1,790,200 with mothers, natives of Great Britain.

The following table shows the origin of the foreign-born population at the census of 1880:—

England, . . .	662,676	Austria-Hungary, . . .	125,550
Ireland, . . .	1,854,571	France, . . .	106,971
Scotland, . . .	170,136	China, . . .	104,468
Wales, . . .	83,802	Switzerland, . . .	88,621
Unspecified, . .	1,484	Russia, . . .	84,279
		Mexico, . . .	68,399
Great Britain, .	2,772,169	Denmark, . . .	64,196
		Holland, . . .	58,090
Germany, . . .	1,966,742	Italy, . . .	44,230
Brit. America, .	717,157	Belgium, . . .	15,535
Norway and		Spain and Portugal, .	13,259
Sweden, . . .	376,066	Luxembourg, . .	12,836

It will thus be seen that the foreign-born population formed 13·3 per cent. of the total population, and of that 41·5 per cent. are natives of Great Britain, and of these two-thirds come from Ireland. Of the total foreign-born population 71 per cent. came from Great Britain and Germany, and only a small percentage came from countries not pre-eminently Teutonic. Besides the countries above mentioned, at least seventeen others are represented among the foreign-born population of the United States. Of New York city one-third of the population is foreign-born.

It is of great advantage to the United States that by far the larger proportion of the immigrants are of the age at which they are best fitted for labour. Only 25 per cent. are under 15, and less than 15 per cent. over 40 years of age, leaving upwards of 60 per cent. of the immigrants in the prime of life at the time of their arrival, prepared to enter at once into their several industrial pursuits.

A slight analysis of the census returns shows the singular physiological change which has come over the population of the United States during the present century. Such a rapid and extensive alteration in the race, the *personnel* of the nation, has taken place that the Americans of the present day can scarcely be said to be the descendants of the Americans of Washington's epoch. The founders of the great republic have not so much multiplied as they have been superseded. The colonists who defied Great Britain in 1776, and established their independence in 1783, were the lineal and unspoiled descendants of the two best classes which England ever sent forth. They sprang, not only without degeneracy, but with the invigoration of a transplanted life, from the *élite* of Englishmen—the Puritans and Pilgrim Fathers who settled in New England, and the gallant and adventurous Cavaliers who colonized Virginia, Carolina, and Baltimore. The returns show that a very small proportion of the present citizens of the States are the pure genuine descendants of the chivalrous, religious, and high-minded Anglo-Saxons who won their independence under Washington.

Such a change as this, in less than a hundred years, can scarcely have taken place without entailing a change of character of almost equal magnitude; and this should be remembered in connection with the fact that in the course of seventy years many of the political safeguards to which the founders of the republic trusted for its political purity and greatness have been swept away.

The north-eastern states, the oldest settled portions of the country, bear the greatest resemblance to Great Britain. The villages of New England are uniformly clean, airy, and neat, with spacious openings near the centre, in which churches form the most prominent feature. The houses

are in some instances built of brick, but more frequently of wood, painted white, with green Venetian blinds, opening to the outside. Both churches and dwelling-houses seem to be painted almost annually; at least they are never seen in the slightest degree dingy-coloured. The houses, of every size and fabric, have a light appearance, from the number of windows they contain, and the villages only want the judicious aid of flowers and shrubs to render them beautiful. Landscape gardening, and similar ornamental work is, however, very backward in nearly every part of America.

In the newly-settled states of the west the farmer is of course obliged to dispense with much of the civilization of the east, and lives in his log-house with a few necessary articles of furniture in the rudest and most primitive manner. But if his style of life be less comfortable, he reaps the benefit of his privations in a more rapid accumulation of wealth. Nothing is more striking to a European in America than the entire absence of pauperism, rags, and beggars, and the universal respectability of appearance of all classes. The equal distribution of wealth in the United States is certainly a very marked feature of the nation. Whilst there may be said to be no poor, the number is also comparatively few of those who would be classed as very rich in England. In a word, the wealth of America is diffused. You find only a few inordinately rich, but you find nearly every one able to meet the demands that can be justly made on him.

In many parts of the newly-settled north-west there is a large number of half-breeds, or descendants of whites and Indians; but beyond the perpetuation of numerous local names, the impress left upon the older and more thickly settled portions of the country by its aboriginal inhabitants is scarcely discernible. They have there nearly all disappeared, and the few that remain are chiefly gathered in small communities by themselves, more or less assimilated in modes of life to their white neighbours. In the extreme west a few still roam in all their primitive wildness. Some of the Indians who are settled on the extensive and fertile territory that has been especially set apart for them to the immediate west of the State of Arkansas, are progressing towards a state of comparative civilization. Persons, however, of experience in Indian affairs entertain strong doubts of ever reclaiming the tribes to any great extent from their present state of wildness. General Sheridan, for instance, speaks of them in the following discouraging strain:—"The Indians," he says, "have run riot for many years along the lines of our western settlements, and along the immigrant and commercial lines of travel, murdering and plundering without any adequate punishment. The Indian is a lazy, idle vagabond. He never labours, and has no profession except of arms, to which he is raised as a child. A scalp is constantly dangled before his eyes, and the highest honour he can aspire to is to possess one taken by himself." These opinions are, it must be confessed, concurred in by many men who have been thrown in contact with the Indians, and who are inclined to regard them as a hopelessly unredeemable race of savages, which is doomed to disappear in company with the buffalo before the overwhelming march of a more civilized and enlightened population.

Negroes were introduced as slaves into all the colonies in their infancy, and up to the time of the Emancipation Act of 1865 were held as such in fifteen of the thirty-four states, forming in some nearly or more than half the population. The importation of slaves into the United States was interdicted by law in 1808. In 1774 the legislature of Rhode Island interdicted the importation of slaves into that colony; and the next year, and while still a British colony, passed a law of emancipation by declaring the children of all slave mothers to be born free. Massachusetts abolished slavery by the bill of rights in 1780.

Connecticut, in 1784, put a stop to the introduction of negroes, and declared all born after 1st March of that year free at the age of twenty-six. Pennsylvania prohibited the introduction of slaves in 1780, and declared free all children of slave mothers born after the passing of the law. Virginia prohibited the importation of slaves in 1778, and Maryland in 1783. Slavery was abolished in New Hampshire in 1792, in New York in 1799, and in New Jersey in 1825, and the constitutional amendment of 18th December, 1865, abolished it throughout the whole of the States. The commingling of the negroes with the whites has produced a numerous class of hybrids of all shades of complexion, known, according to their respective proportion of African blood, as samboes, mulattoes, quadroons, octoroons, &c.

It may be as well to state that the population of the United States has been ascertained at all times with very great accuracy. The census is taken in obedience to article 1, section 2, of the constitution, which provides that "representatives and direct taxes shall be apportioned among the several States which may be included in this Union, according to their respective numbers, and for this purpose an actual enumeration shall be made every ten years."

*Revenue and Expenditure.*—In examining the financial position of the United States, the first and most striking feature is the comparatively small amount of the ordinary national expenditure which sufficed up to 1860. Whilst the expenditure of Great Britain and Ireland in that year amounted to upwards of £68,000,000, that of the United States in the same year was only £15,500,000; and this amount included a payment of about 14,000,000 dollars, or £2,800,000, on account of the principal of the public debt then owing by the nation. The entire interest of the public debt at that time amounted to only 3,144,620 dollars, or £650,000.

In proportion to population, the United States, in 1860, had the smallest expenditure and the smallest national debt of any country in the world. The whole revenue was raised from customs duties and sales of land. For a long series of previous years there can scarcely have been said to have been any direct internal taxation for national purposes in America. At the outbreak of the war of 1812 the expenditure of the United States was only 13,500,000 dollars, or £2,700,000 a year, the whole of which was met by light and easy customs duties. The war of 1812 raised the expenditure from 13,000,000 dollars to 22,000,000 39,000,000, and 48,000,000 dollars; and it was then found necessary to levy direct taxes. But about the year 1818 a surplus, amounting to nearly 40,000,000 dollars, being found in the exchequer, the burden of direct taxation was removed, and the internal taxes became of merely nominal amount up to 1836, when they ceased entirely. In addition, therefore, to having the smallest proportionate expenditure of any nation, the people of the United States, during the greatest part of the present century, enjoyed the remarkable advantage of being the most lightly taxed people of the world. If the enhanced prices of certain classes of manufactures, caused by customs duties imposed for the purpose of protection, be excepted, the people of the United States may be said to have, practically, paid no taxes for national objects.

But the breaking out of the Civil War in 1861 altered the whole condition of the expenditure and revenue of the United States. The total expenditure, which was 77,000,000 dollars in 1860, rose to 85,000,000 dollars in 1861, to 571,000,000 dollars in 1862, to 715,000,000 dollars in 1863, and to no less than 1,897,000,000 dollars in 1865, or from £15,000,000 to nearly £380,000,000 in five years. The bulk of this enormous expenditure of course went for purposes of war. Out of the 1,897,000,000

dollars, the army and navy absorbed 1,153,000,000 dollars or nearly two-thirds of the whole. During the last year of the war the public debt increased 941,902,587 dollars (about £190,000,000); and in August, 1865, when it was at its maximum, the total debt was 2,757,689,571 dollars, or nearly £560,000,000. The interest on the debt rose from 3,000,000 dollars in 1860 to more than 140,000,000 in 1865; or to nearly as much as double the sum-total of the national expenditure for the five years previous.

To meet this large expenditure, not only were the customs duties largely enhanced, but direct and internal taxes of large amounts were levied, and greatly augmented in each successive year. They produced as follows:—

#### PRODUCT OF DIRECT TAXATION IN AMERICA.

Years.	Dollars.
1862, . . . . .	1,795,332
1863, . . . . .	41,003,192
1864, . . . . .	116,850,672
1865, . . . . .	211,129,529

Thus upwards of £42,000,000 sterling was levied in the form of direct internal taxation during the last year of the war.

But even in the darkest hours of the conflict there appears to have been no hesitation among the bulk of the people of the North. They were prepared to submit to any outlay—to any burden of taxation possible to be borne—in order to bring the war to a conclusion and to preserve the Union; and when the war was brought to a termination, and the South once again came under the peaceful and undisputed control of the general government, it seems to have been felt that no ground for alarm or distrust remained; and that, once brought back to the prosperity which they had previously enjoyed, the South would in due time contribute largely to the liquidation of the public debt, and would thereby vastly relieve the heavy pressure of the burden of general taxation.

The revenue of the United States is mainly derived from two sources—namely, duties on imports, and internal revenue taxes upon distilled spirits, fermented liquors, tobacco, banks and bankers. The national expenditure is mainly on account of the war and navy departments, pensions, payment of interest of the public debt incurred by the Civil War of 1861-66, and the civil service. Pensions form the largest item of expenditure. Next to pensions, the cost of the general administration, including the expenses of the executive and legislature, provided for under the head of "Civil Expenses," is comparatively small.

The following table exhibits the total net revenue and the total ordinary expenditure of the United States in each of the ten fiscal years ending 1886:—

Years.	Revenue.	Expenditure.
	Dollars.	Dollars.
1877	281,406,418	241,334,474
1878	257,763,878	286,964,327
1879	273,827,184	266,947,883
1880	333,526,610	267,642,958
1881	360,782,292	260,712,887
1882	403,525,250	257,981,410
1883	398,287,581	265,408,138
1884	348,519,869	244,126,244
1885	323,690,706	260,316,935
1886	336,439,727	242,483,138

These figures are exclusive of loans in the revenue and

expenditure, other than interest, and premiums in connection with the public debt.

The following table gives the actual sources of revenue and branches of expenditure for the fiscal year 1886:—

REVENUE.	1886.	EXPENDITURE.	1886.
	Dollars.		Dollars.
Customs taxes, . . . . .	192,905,023	Civil expenses, . . . . .	21,955,604
Internal revenue, . . . . .	116,805,937	Foreign intercourse, . . . . .	1,332,320
National bank taxes, . . . . .	2,693,713	Indians, . . . . .	6,099,158
Sales of public lands, . . . . .	5,630,999	Pensions, . . . . .	63,404,864
Profits on coinage, . . . . .	5,904,619	Military establishment, . . . . .	34,324,155
Customs fees, . . . . .	1,014,784	Naval establishment, . . . . .	13,907,886
Consular fees, . . . . .	3,383,570	Miscellaneous, including public build- ings, lighthouses, &c., . . . . .	47,986,683
Pacific railways, interest, . . . . .	679,189	District of Columbia, . . . . .	2,892,322
Pacific railways, sinking fund, . . . . .	1,097,906	Interest on public debt, . . . . .	50,580,146
Surveying public lands, . . . . .	192,736		
Sales of government property, . . . . .	268,390		
Immigrant fund, . . . . .	181,547		
Soldiers' Home, permanent fund, . . . . .	245,437		
Sale of condemned naval vessels, . . . . .	40,357		
Revenues of Columbia District, . . . . .	2,105,831		
Miscellaneous sources, . . . . .	3,289,689		
Total ordinary receipts, . . . . .	336,439,727	Sinking fund, . . . . .	212,483,138
			44,551,043
		Total ordinary expenditure, . . . . .	287,034,181
		Leaving a surplus of . . . . .	49,405,546

The surpluses are all available for reducing the public debt. The internal revenue at present is collected mainly from whisky, tobacco, and malt liquors.

The following table shows the total amount of the national debt on the 1st of July at various periods from 1860:—

Years.	Capital of Debt.	Years.	Capital of Debt.
	Dollars.		Dollars.
1860	64,812,287	1882	1,918,312,994
1866	2,773,236,173	1883	1,884,171,728
1877	2,205,301,392	1884	1,830,528,923
1880	2,120,415,370	1885 (Nov. 1)	1,848,340,335
1881	2,069,013,569	1886	1,724,419,463

The net debt—that is, what remains after deducting the cash in the Treasury—was 1,350,000,000 dollars in 1887; of this amount, 550,000,000 dollars bears no interest. Included in these figures is the United States liability for 64,623,512 dollars (or £12,924,702) 6 per cent. bonds issued to the Pacific Railways, which pay over 5 per cent. of their net earnings. The bulk of the debt of the United States was originally contracted at 6 and 5 per cent., but more than half of the interest-bearing debt is now at 4 per cent., and the rest at 3 and 4½ per cent. So prosperous is the United States that the income is always several millions per annum in excess of the expenditure, and there is no more debt ready to be paid off. In Europe the surplus would, of course, be devoted to the reduction or repeal of taxes, but the protectionists in America regard taxes as good things, and strongly object to their repeal or diminution. The result is such a large accumulation of coin in the Treasury that business is sometimes contracted for the want of currency. President Cleveland's message to Congress in 1887 was devoted exclusively to the subject, and with the view of getting rid of the surplus he strongly urged a considerable addition to the list of free imports, an abolition or great reduction of the duties on raw materials, and also on all necessities.

Besides the above there exist local debts in nearly all the States, amounting in 1886 to 263,175,245 dollars. If to this be added the debts of counties, townships, towns, &c., it would raise the entire local debt to £220,000,000 sterling. The national debt of the United States amounts to £5 per head of population, and the annual interest to 3s. 6d.

per head. There is practically no direct taxation for national purposes, though personal and real property are taxed in the several states. The total value of the exports in 1886 was equal to more than one-third of the principal of the debt, and the excess of exports over imports amounted to three-fourths of the annual interest of the debt. The assessed valuation of the real property in the States was returned for 1880 at 13,036,766,925 dollars, or £2,607,353,385, and personal property 3,866,226,618 dollars, or £773,245,323, being a total of £3,380,598,708. The total amount of real and personal property as more recently assessed amounts to 19,790,333,650 dollars, or £4,122,986,200.

*Army and Navy.*—By the eighth section of the first article of the constitution of the United States, Congress is empowered in general “to raise and support armies;” and by the second section of the second article the president is appointed commander-in-chief of the army and navy, and of the militia when called into the service of the United States. On 7th August, 1789, Congress established a Department of War as the instrument of the president in carrying out the provisions of the constitution for military affairs. A number of “Original Rules and Articles of War” were enacted by the Congress of 1776, and continued in force under the constitution with several modifications. These rules were the basis of the actual Articles of War which were enacted in 1806, and have been but slightly altered since that time. They form the military code which governs all troops when mustered into the service.

In 1790 the rank and file of the army, as fixed by an Act of Congress, amounted to 1216 men, to which force, in the next year, one regiment, 900 strong, was added. In 1792 an Act of Congress provided for a uniform militia throughout the United States, and the system then arranged has received but slight alterations up to the present time. The nominal strength of the militia thus organized amounts to 3,250,000 men. This body is entirely under the control of the governors and legislative assemblies of the individual states, except when it is called into the active service of the general government, when they are placed under the control of the president. In 1796 the regular army consisted of a corps of artillery and engineers, two companies of light dragoons, and four regiments of infantry of eight companies each. This force was little increased, except occasionally (as during the war with Britain in 1812–14

and the Mexican campaign), till the outbreak of the Civil War.

At the commencement of the year 1861 the United States army comprised about 14,000 regular troops, stationed chiefly in the Southern States. A large number of these joined the cause of the so-called Confederate States, reducing the Federal army to less than 5000 men. On 15th April, 1861, the president called out 75,000 volunteers, for three months, to defend the capital, which was threatened; and on 3rd May he called out 42,000 more to serve for three years or during the war. On 22nd July, 1861, Congress passed an Act authorizing the president to accept the services of 500,000 volunteers for such terms as he might deem necessary, ranging from six months to three years or during the war. On 25th July, 1861, the president was again authorized to call out 500,000, making in all 1,000,000 men. This number proving insufficient for the active prosecution of hostilities and the repair of losses occasioned by the war, a draft was ordered in the summer of 1863 by proclamation of the President of the United States. By a new proclamation of the president, dated 17th October, 1863, a levy of 300,000 men was ordered, and another call of 500,000 men was made on 1st February, 1864. The total number of men called into the field by the government of the United States, from 1861 till the end of the Civil War in 1865, amounted to 2,653,062, or nearly one-fourth of the entire male population of the Northern States. This vast number served various terms of service, from three months to three years; but so many served the longer term that when reduced to the three years' standard the aggregate terms of service were equivalent to 2,129,041 men serving for three years.

The army was supplied in various ways—volunteering, enlistment in the regular army, and by drafts and conscripts, but the greater part by bounties of from 300 to 1000 dollars to each volunteer. Large numbers of recruits were also supplied by newly-arrived immigrants, and at the close of the war the Federal forces comprised nearly 50,000 negro troops recruited in those Confederate states which had been successfully invaded by the northern armies. Of the troops enrolled during the war the state of New York furnished over one-sixth of the whole number, Pennsylvania one-eighth, Ohio one-ninth, and Massachusetts one-fifteenth, these four giving to the army one-fifth of their entire male population. New Hampshire and Vermont sent one-fourth of their male citizens, and Indiana and Illinois rather more. Kansas showed the highest proportion, having sent 36 per cent. of her men, while Iowa sent 30 per cent.

The Southern, or Confederate States, had in the field during the greater part of the war 400,000 men, of whom, it is estimated, they lost 350,000 from wounds and disease. The Southern army was entirely disbanded in April, 1865, and of the Federal volunteers all except 11,000—temporarily retained for service—were mustered out before the 1st November, 1865, only five months after the war was concluded. The antipathy to a standing army so long cherished in England, exists in an even exaggerated form among the Americans. Hardly was the struggle for independence over when Congress disbanded almost the whole force under arms, and even, it is said, intended to place a permanent limitation upon the number of soldiers to be raised at any time and in any circumstances. It was actually proposed that the limit should be fixed at 5000 men, but Washington crushed the proposition with an unexpected stroke of humour. He suggested the addition of a clause providing "that no enemy shall invade the United States with more than 3000 men."

In 1866 the numbers of the regular army were fixed by Act of Congress at 50,000; and another Act, in 1870, reduced those numbers to 30,000. Under a still later Act

the number after 1875 was limited to 25,000. The actual number in 1886 was 24,412.

Even this limited force is by no means confined to strictly military duty, but is frequently employed upon road-making, erecting public buildings, tax-collecting, and a good deal of promiscuous police duty, in addition to the very valuable signal corps, or "weather bureau," as it is called. From all parts of the States' seaboard reports of observations are telegraphed at a given moment to the signal office at Washington, and a general forecast of the weather is deducted from these, and immediately furnished to the press. The reports are made so that even unscientific men may trace any great atmospheric movement, and the plan is highly appreciated by all agricultural and commercial associations. To the army is also confided the care of seventy-four national cemeteries, in which are interred about 350,000 persons, mostly soldiers who fell in the Civil War.

The officers of the regular army in the United States are chiefly supplied by cadets, who are nominated from each state by members of Congress, and appointed by the president. They are educated at the military academy, West Point, New York. The pay of a colonel is about £550 a year, that of a captain about £250, and that of a lieutenant £200. These sums do not include the very liberal allowances made for lodging, fuel, and rations. The chief arsenals in the United States are at Springfield (Massachusetts), and Pittsburg (Pennsylvania).

The territory is divided for military purposes into ten departments, and these are grouped into four military divisions, viz. Divisions of the South, the Missouri, the Pacific, and the East.

The sea-coast forts have recently undergone complete change. They were planned at a time when the 8-inch gun was the heaviest afloat, and before rifled guns came into use. The Board of Engineers in New York accordingly laid down these five general propositions, which were approved of at headquarters, and have been applied to all modifications of the sea-coast forts:—(1) The use of barbette batteries of earth with deep parapet, and a liberal number of bomb proof and magazine traverses; (2) the use of the heaviest guns practicable, with carriages admitting of the gun being depressed below the parapet for loading; (3) an abundant supply of heavy mortars; (4) the use of torpedoes; (5) entanglements to hold the attacking fleet long enough for destruction.

For a period of nine years after the government of the United States was organized, there was no separate navy department. The duties were at first performed by the war department, and it was not until 30th April, 1798, that a navy department was created.

The naval forces of the United States at the commencement of the year 1861 consisted of forty-one men-of-war on active service, the greater number of them sailing vessels. Congress having then decreed the creation of a steam navy, no less than 500 steamers of different sizes were built between that time and the close of the war. The sailing vessels were also increased to over 100, so that the total fleet amounted to upwards of 600 vessels, carrying nearly 5000 guns, and being upwards of 500,000 tons burden. Several of the vessels were of the monitor class, and carried very heavy armaments. That such a number of vessels should have been constructed in so comparatively short a time was very significant of the resources at the command of the United States. The quality of the ships, however, is another matter. They may have served the emergency, but there were very few in which some grave defect was not found, large numbers only survived their trial to be found of no practical service whatever, and in most of the others a speedy decay set in owing to the use of unseasoned timber.

The present strength of the navy of the United States is



difficult to state precisely. In 1884 it was nominally eighty-seven vessels, but of these only thirty-one were estimated to be efficient. Efforts have, however, since been made to place it on a more efficient footing. The comparatively inexpensive but most effective kind of naval defence by means of submarine TORPEDOS has of late years attracted very great attention in America. The destructive power of this instrument was shown during the Civil War, and since that time considerable attention has been given to the subject by officers of the navy. In 1869 a torpedo corps was established, under the Bureau of Ordnance, to make experiments, take charge of the apparatus, and perfect a system for the application of this means of defence to the coasts and harbours. The system properly applied, in conjunction with a system of harbour obstructions, backed by monitors and supported by the forts and water batteries which command the narrow entrances to the principal harbours, will, in the opinion of good authorities, defy any power which could cross the ocean to attack them.

*Government.*—The several states of the Union, so far as their internal affairs are concerned, are sovereign and independent, while for the common interests of all they delegate a portion of their powers to a central government, whose edicts and laws, so long as they are not in conflict with the constitution, are paramount to state authority. The government consists of three branches—the legislative, executive, and judicial. The executive power is vested in a president, who is the only executive officer known to the constitution, and who, together with a vice-president, is elected for four years by a college of electors, appointed in every state as the respective legislatures may direct, each one returning as many electors as it is entitled to have senators and representatives in Congress. In South Carolina the electors are chosen by the legislature; in all the other states by popular vote. In case of the removal, death, resignation, or inability of the president, the vice-president succeeds to the presidency; and in case of the failure of both president and vice-president, Congress has authority to declare what officer shall act as president until the disability be removed or a president shall be elected. By Act of Congress, approved 1st March, 1792, the president of the Senate *pro tempore*, or in case there be no president of the Senate, the speaker of the House of Representatives, is to act as president in such a case. The latter contingency has never yet occurred, and the former only in four instances—viz., on the death in office of Presidents Harrison (1841), Taylor (1850), Lincoln (1865), and Garfield (1881).

When there is no election of president by the people for want of a majority of electoral votes for any one candidate, the House of Representatives chooses the president from the three having the highest number of votes—the body of representatives from each state giving a single vote. Two elections by the House have occurred—viz., in 1800 (under the original provision of the constitution, which requires that the highest candidate should be president, and the next highest vice-president), when there being a tie between Thomas Jefferson and Aaron Burr, the former was chosen president by the House; and in 1824, when John Quincy Adams was chosen. The president, as well as all other civil officers, may be removed from office on impeachment for, or conviction of, treason, bribery, or other high crimes and misdemeanours. The president has power, by and with the advice and consent of the Senate, to make treaties and to choose ambassadors and other public officers of the United States whose appointment is not otherwise provided for. The president receives a salary of 50,000 dollars (£10,000) a year, and the vice-president 10,000 dollars (£2000). All Acts of Congress must be presented to the president before they can become law, and he may, within ten days from its presentation,

return any bill of which he disapproves to the House in which it originated, stating his objections. If, on consideration, the bill is again passed by two-thirds of each house, it becomes law. The occasions when presidents of the United States have used their veto power have been very rare, except during the presidency of Andrew Johnson, who used it more frequently than all his predecessors in office together. From the establishment of the republic to the end of the year 1866, a period embracing thirty-nine Congresses, there were but twenty-eight vetoes, being an average of one in three years. Of these vetoes President Washington sent two to Congress; President Madison, six; President Monroe, one; President Jackson, nine; President Tyler, four; President Polk, three; President Buchanan, one; and President Johnson, two. Presidents John Adams, Jefferson, John Quincy Adams, Van Buren, Harrison, Taylor, Fillmore, Pierce, and Lincoln sent no vetoes to Congress, and their administrations covered an aggregate of nearly thirty-three years. Of the twenty-six vetoes sent to Congress prior to the administration of Andrew Johnson, in but one case, and that an unimportant matter, were the adherents of the rejected bills able to muster two-thirds of the members for their passage, but it was done repeatedly with regard to President Johnson's vetoes. If any bill is not returned by the president within ten days after it has been presented to him, it becomes a law in like manner as if he had signed it. The elections for president and vice-president are held in all the states on the first Tuesday in November, every four years; and on the 4th of March following the president-elect is inaugurated. He must be a natural-born citizen, at least thirty-five years of age, and fourteen years a resident within the United States. He is assisted by a cabinet of seven ministers, called the secretaries of state, of the treasury, of the interior, of the navy, and of war, the attorney-general, and the postmaster-general, who are nominated by him, and whose appointments are confirmed by the Senate. They each receive 10,000 dollars a year. These officers have no seat in Congress, and are solely responsible to the president, by whom they may be removed at pleasure.

The whole legislative power is vested by the constitution in a Congress, consisting of a Senate and House of Representatives. Among the Second Chambers of the world the Senate of the United States unquestionably holds the foremost place. The theory of the American constitution is that the Senate represents the people as organized in states, while the members of the House of Representatives are returned on a simple population basis. Every state of the Union is represented by two senators, each of whom, it is stipulated, shall have one vote. The double representation, not varying with the size or importance of the state represented, was borrowed from the established system in this country, where, before the era of parliamentary reform, every county, large or small, populous or half-deserted, Yorkshire and Rutland, Middlesex, Huntingdonshire, and Cumberland, sent two knights of the shire to the House of Commons, so that, as was commonly argued, the constituency should not be left without a spokesman through the accidental absence of one of its members. The limitation to a single vote was introduced, because, in the Continental Congress under the confederation which preceded the existing constitution, the voting had been by states, and it was necessary to release each member of the new legislative and deliberative body from the obligation of always taking the same view as his colleague. The contrast between the effect of the state representation and the division of power according to population was conspicuous from the outset, but has grown greater with the growth of the Union. When the original thirteen colonies or states accepted the constitution the Senate consisted of twenty-six members, and sixty-five were assigned to the House of

**Representatives.** As each state has been incorporated in the Union the Senate has received two additional members, while there has been a new apportionment of members for the House of Representatives after each decennial census. The thirty-eight states at present constituted are represented by seventy-six members.

The state legislatures elect the senators for each state for a term of six years. It was provided at the beginning of the constitutional period that the members of the Senate should be divided into three sections, "so that one-third might be chosen every second year," and the process now is a regular one. Each senator sits for six years, but one-third of the whole number have to be renewed on the expiration of their term, when the biennial election of the House of Representatives takes place. Arrangements are so made that the two senators from each state have to be elected to different Congresses. The Senate is thus the most permanent element in the political system. The executive is chosen for four years and the Lower House for two years, but each senator sits for six years, and, in the normal course of things, not more than one-third of the Senate can, at any given time, consist of new men, nor can any state be left without the services of at least one experienced politician in the Upper House. The State legislatures, which are the electing bodies, are, like the Federal legislature, bi-cameral, and it is remarkable that down to recent time no provision was made for the failure of an agreement between the two branches. It was only in 1866 that Congress, acting on the power given in the constitution to make regulations as to the "manner of holding elections for senators and representatives," passed an Act providing that if the two branches of any State legislature did not concur in the choice of the same person to fill a vacant senatorship, both branches should meet together as a single body *ad hoc*, and elect to the vacancy by an absolute majority of the votes of those present. The operation of indirect election through the State legislatures is favourable to local influences, which are further strengthened by the condition that every senator must be "an inhabitant of that state for which he shall be chosen." He must also be at least thirty years of age, and must have been for nine years a citizen of the United States.

Every senator as well as every representative and territorial delegate in Congress has a salary, or, as it is called in the constitution, "remuneration for his services," of 5000 dollars a year, with travelling expenses, paid out of the Federal Treasury; he is privileged from arrest, except for treason, felony, and breach of the peace, and he cannot be called to account for any speech or debate in Congress. He cannot be appointed, during the term for which he was elected, to any office under the Federal government that may have been created or increased in salary during that term, and the acceptance of any civil office under the Federal government is a disqualification for election to or continuance in either House. The Vice-president of the United States is *ex officio* the President of the Senate, but he is not a member, and has only a casting vote. Owing to the limited number of members and to the delegation of the larger part of the business to a great number of standing committees, the debates in the Senate are not usually prolonged, the work is light, the Senate Chamber is a fine one, and the tone of controversy is distinctly higher than in the Lower House. In respect of legislation, the Senate has precisely the same power as the Lower House, except that it cannot originate money bills, though, unlike the House of Lords, it can amend and alter as well as reject such bills.

The control given to the Senate over the exercise by the executive of the treaty-making power is one of the causes to which the Foreign Affairs Committee of the former body owes its importance. The proceedings of that committee are secret, as are discussions in the Senate on

questions touching negotiations or engagements with other powers. But, from a practical point of view, the control over the president's rights of patronage is the most notable of those powers outside the proper sphere of legislation which the Senate possesses under the constitution. The inferior officers are generally appointed, under various statutes, by the president directly—as in the case of naval and military officers, federal officials in the customs and excise, and those connected with the administration of justice—or by the members of the cabinet, and especially the postmaster-general, who has his nominees necessarily in every township of the Union. In the appointment of the higher officers the Senate must concur. The limited number of the Senate affords no adequate scope for the political ability of the American people, but the sphere is actually even more restricted than is at first apparent. It is provided that the senators shall be residents in the states they represent, and, as a matter of fact, they are almost always not only residents but natives. In Great Britain constituencies are proud to secure the services of eminent men, wherever they may have been born. The result of the restriction in the United States is that there are only two public men in each state who can hope to secure, at any given time, a place in political life worthy of honourable ambition, and, of course, where the opposite party happens to be predominant there is no opening for such ambition at all.

The House of Representatives, or Lower House, is composed of members elected every second year by the people of the several states—the number to which each is entitled being decided by its population at the last census. The total of the representatives, based on the census of 1880, was 325. Representatives must not be less than twenty-five years of age, must have been citizens of the United States for seven years, and be residents in the states for which they are chosen. In addition to the representatives from the states, the House admits one from each organized territory, who has a right to speak on subjects in which his district is interested, and may originate subjects for legislation, but is not entitled to a vote.

By the eighth section of the first article of the constitution of the United States the Congress has power:—

1. To lay and collect taxes, duties, imposts, and excises, to pay the debts and provide for the common defence and general welfare of the United States; but all duties, imposts, and excises shall be uniform throughout the United States.

2. To borrow money on the credit of the United States.

3. To regulate commerce with foreign nations, and among the several states, and with the Indian tribes.

4. To establish a uniform rule of naturalization, and uniform laws on the subject of bankruptcies throughout the United States.

5. To coin money and regulate the value thereof, and of foreign coin, and fix the standard of weights and measures.

6. To provide for the punishment of counterfeiting the securities and current coin of the United States.

7. To establish post-offices and post-roads.

8. To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

9. To constitute tribunals inferior to the Supreme Court.

10. To define and punish piracies and felonies committed on the high seas, and offences against the law of nations.

11. To declare war, grant letters of marque and reprisal, and make rules concerning captures on land and water.

12. To raise and support armies, but no appropriation of money to that use shall be for more than two years.



13. To provide and maintain a navy.

14. To make rules for the government and regulation of the land and naval forces.

15. To provide for calling forth the militia to execute the laws of the Union, suppress insurrections, and repel invasions.

16. To provide for organizing, arming, and disciplining the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the states respectively the appointment of the officers, and the authority of training the militia according to the discipline prescribed by Congress.

17. To exercise exclusive legislation, in all cases whatsoever, over such district (not exceeding 10 miles square) as may, by cession of particular states, and the acceptance of Congress, become the seat of the government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the state in which the same shall be for the erection of forts, magazines, arsenals, dockyards, and other needful buildings.

18. To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all others vested by this constitution in the government of the United States.

The times, places, and manner of holding elections for senators and representatives are prescribed in each state by the legislature thereof; but Congress may at any time by law alter such regulations, or make new ones, except as to the places of choosing senators. No senator or representative can, during the time for which he was elected, be appointed to any civil office under authority of the United States which shall have been created, or the emoluments of which shall have been increased, during such time; and no person holding any office under the United States can be a member of either House during his continuance in office.

The period usually termed "a Congress," in legislative language, continues for two years; as, for example, from noon 4th March, 1887, until noon 4th March, 1889. Congresses always commence and expire in years terminating with odd numbers. The term of the first Congress was from 1789 to 1791, and the term of the fiftieth, from 1887 to 1889.

The separate states of the Union are sovereign in a municipal capacity; while the general government is sovereign in a national capacity, and is represented and known officially as the government of one nation. For instance, although the several states are sovereign and independent under the constitution, with all powers of local legislation, eminent domain (i.e. absolute possession of the soil), and the power of life and death, with which neither president nor Congress can interfere, they cannot make treaties, coin money, levy duties on imports, or exercise any of the powers granted to Congress.

The constitutions of the several states all agree in their main features, and the powers vested in them are principally the same. In all there is the same form, and the same principles lie at the foundation. Most of the legislatures are elected by what is tantamount to universal suffrage. The executive in every state is vested in a governor. The duties of the governors are in general analogous to those of the president, as far as the several state governments are analogous to those of the Union. They have the nomination, and, in conjunction with the Senate, the appointment of many important officers. Like the president also, they make recommendations to the legislature, and take care that the laws are executed. The territories are ruled by a governor appointed by the president, but they elect their own legislatures.

The Congress of the United States has the power to alter the constitution, by the fifth article of the same. This article orders that the Congress, whenever two-thirds of both Houses shall deem it necessary to propose amend-

ments to the constitution, or on the application of the legislatures of two-thirds of the several states, shall call a convention for proposing the amendments, which in either case shall be valid to all intents and purposes as part of the constitution, when ratified by the legislatures of three-fourths of the several states, or by conventions in three-fourths thereof, as the one or the other mode of ratification may be proposed by the Congress. No alteration was made in the constitution from 1804 until 1861, when on 18th December of the latter year the memorable Thirteenth Amendment, which abolished slavery, was passed. Two subsequent amendments were made, one in 1868 and the other in 1870, both to complete the vast change in the political and social organization of the republic which was commenced by the Thirteenth Amendment. The Fourteenth and Fifteenth Amendments admit the former slaves into all the rights and privileges of citizenship, of the elective franchise, and of office, and declare that in these respects no discrimination shall be made among the citizens of the United States on account of race, colour, nativity, property, education, or creed.

Since the adoption of the constitution the offices of president and vice-president have been occupied as follow:-

## PRESIDENTS OF THE UNITED STATES.

Name.	From State.	Term of Service.	Born	Died
George Washington, . . .	Virginia, . . .	1789-1797	1732	1799
John Adams, . . . . .	Massachusetts, . . .	1797-1801	1735	1826
Thomas Jefferson, . . .	Virginia, . . . . .	1801-1809	1743	1826
James Madison, . . . .	Virginia, . . . . .	1809-1817	1751	1837
James Monroe, . . . .	Virginia, . . . . .	1817-1825	1759	1831
John Quincy Adams, . .	Massachusetts, . . .	1825-1829	1767	1848
Andrew Jackson, . . .	Tennessee, . . . . .	1829-1837	1767	1845
Martin Van Buren, . . .	New York, . . . . .	1837-1841	1782	1862
William H. Harrison, . .	Ohio, . . . . .	1841-1841	1773	1841
John Tyler, . . . . .	Virginia, . . . . .	1841-1845	1790	1862
James K. Polk, . . . .	Tennessee, . . . . .	1845-1849	1795	1849
Zachary Taylor, . . . .	Louisiana, . . . . .	1849-1850	1784	1850
Millard Fillmore, . . .	New York, . . . . .	1850-1853	1800	1874
Franklin Pierce, . . . .	New Hampshire, . . .	1853-1857	1801	1869
James Buchanan, . . . .	Pennsylvania, . . . .	1857-1861	1791	1868
Abraham Lincoln, . . .	Illinois, . . . . .	1861-1865	1809	1865
Andrew Johnson, . . .	Tennessee, . . . . .	1865-1869	1808	1875
Ulysses S. Grant, . . .	Ohio, . . . . .	1869-1877	1822	1885
Rutherford B. Hayes, . .	Ohio, . . . . .	1877-1881	1822	—
James A. Garfield, . . .	Ohio, . . . . .	1881-1881	1831	1881
Chester A. Arthur, . . .	New York, . . . . .	1881-1885	1830	1886
Grover Cleveland, . . .	New Jersey, . . . .	1885-1889	1837	—
Benjamin Harrison, . .	Indiana, . . . . .	1889-1893	1833	—

## VICE-PRESIDENTS OF THE UNITED STATES.

Name.	From State.	Term of Service.	Born	Died.
John Adams, . . . . .	Massachusetts, . . .	1789-1797	1735	1826
Thomas Jefferson, . . .	Virginia, . . . . .	1797-1801	1743	1826
Aaron Burr, . . . . .	New York, . . . . .	1801-1805	1756	1836
George Clinton, . . . .	New York, . . . . .	1805-1812	1750	1812
Elbridge Gerry, . . . .	Massachusetts, . . .	1813-1814	1744	1814
Daniel T. Tompkins, . .	New York, . . . . .	1817-1825	1774	1825
John C. Calhoun, . . . .	South Carolina, . . .	1825-1832	1782	1850
Martin Van Buren, . . .	New York, . . . . .	1833-1837	1782	1862
Richard M. Johnson, . .	Kentucky, . . . . .	1837-1841	1780	1850
John Tyler, . . . . .	Virginia, . . . . .	1841-1841	1790	1862
George M. Dallas, . . .	Pennsylvania, . . . .	1845-1849	1792	1864
Millard Fillmore, . . .	New York, . . . . .	1849-1850	1800	1874
William R. King, . . . .	Alabama, . . . . .	1853-1853	1786	1853
John C. Breckinridge, . .	Kentucky, . . . . .	1857-1861	1821	1875
Hannibal Hamlin, . . .	Maine, . . . . .	1861-1865	1800	—
Andrew Johnson, . . .	Tennessee, . . . . .	1865-1865	1808	1875
Schuyler Colfax, . . . .	New York, . . . . .	1869-1873	1823	1885
Thomas W. Ferry, . . . .	Michigan, . . . . .	1875-1877	1827	—
William A. Wheeler, . .	New York, . . . . .	1877-1881	1819	—
Chester A. Arthur, . . .	New York, . . . . .	1881-1881	1830	1886
Thomas A. Hendricks, . .	Indiana, . . . . .	1885-1885	1819	1885

*Judiciary.*—The judiciary comprises a supreme court with one chief justice (salary 8000 dollars) and eight

associate justices (salary 7000 dollars each), appointed for life by the president, by and with the advice and consent of the senate, and holding one session annually in Washington. The United States are divided into nine judicial circuits, in each of which a court is held twice every year for each state within the circuit. The country is also divided into fifty districts, in each of which there is a court called a district court, composed of one judge, who is elected by the people and resides in the district for which he is appointed, and who is competent to decide minor cases. The circuit courts are composed each of a justice of the supreme court, and a judge of the district court in the district in which the court is held. In most cases each state constitutes a district, but New York, Pennsylvania, Virginia, Georgia, Florida, Mississippi, Louisiana, Arkansas, and California are divided into two, and Alabama, Tennessee, and Iowa into three districts each. The Supreme Court of the United States has jurisdiction in all cases of law and equity arising under the constitution and laws of the United States, and treaties made under their authority; in all cases concerning foreign ministers and agents, in all cases of marine jurisdiction, in all controversies in which the United States shall be a party, in controversies between the Federal government and any state, between different states, or between a state and citizen of another state, between citizens of different states, between citizens of the same, claiming lands under grants of different states, and between a state and citizens thereof, and foreign states, citizens, or subjects. The president can reprieve or pardon a person condemned to punishment by a Federal court, but has no power to interfere with the judgment of the tribunals in the different states. Persons guilty of offences in one state and escaping into another are at once given up, if apprehended.

Courts are established in the United States in each of the territories, their constitution and functions being prescribed by the Act of Congress organizing the district. In general they assimilate closely to the various state courts.

There is also a court to adjudicate claims against the United States, composed of a presiding judge and two associate judges (salary 4000 dollars each), which holds its sessions in the Capitol at Washington.

All the other courts are established by the authority of the several states, and their organization differs according to the state laws.

The trial of all crimes, except in cases of impeachment, must be by jury. The laws are in general based upon the common and statute laws of England, but capital punishment is not often resorted to.

*Ambassadors and Consuls.*—The president, either directly or through the secretary of state and foreign affairs, appoints the ambassadors, consuls, and consular agents to foreign countries. The various grades of foreign envoys and ministers plenipotentiary receive from 6000 to 17,500 dollars per annum. Of these the ambassador to Great Britain receive 17,500 dollars; the ministers to France and China, 15,000 dollars each; those to Spain, Russia, Austria, Prussia, Brazil, and Mexico, 12,000 dollars each; the envoy to Peru, 10,000 dollars; and to Turkey and Chili, each 9000 dollars. Ministers of the second grade receive 7500 dollars per annum; the secretaries of legation, from 1500 to 2500 dollars. The commissioner to the Sandwich Islands receives 6000 dollars per annum. The consuls are paid by fees or salaries, varying from 500 to 7500 dollars per annum.

*Church and Education.*—The constitution of the United States grants perfect equality to all creeds and religions. Nearly all the sects and religious denominations existing in Europe are represented in the United States. At the census of 1880 there were 86,132 Protestant and 5975 Roman Catholic churches; 70,864 Protestant minis-

ters, and 6366 Roman Catholic clergy. The Protestants returned 8,976,260 members or communicants; adding to this an estimate of the families of members and of adherents, the total attached to Protestantism would probably be about 30,000,000. The Roman Catholics claim a total of 6,832,954 adherents. There were in all forty-five separate religious bodies returned in 1880. The most numerous Protestant bodies are the various Methodist sects, with 3,686,114 members; next the Baptists of all kinds, with 2,421,878 members; Presbyterians, 937,610; Lutherans, 950,868; Disciples of Christ, 591,821; Congregationalists, 381,697; Episcopal, 347,781; United Brethren, 157,835; Reformed Church, 236,024; Mormons, 157,835; Friends, 67,643.

The Methodists are the leading denomination in the middle, southern, south-western, and western states, and perhaps also in the Pacific states and the territories; and in New England they occupy either the second or third rank. The Baptists are divided into several denominations. The regular or restricted-communication Baptists are by far the most numerous, and occupy the second rank in numbers in the southern, south-western, and western states. The Freewill Baptists are confined to the northern and north-western states; the Seventh-Day Baptists and Six-Principle Baptists are mostly confined to Rhode Island, Connecticut, and New York. The Church of God or Winebrennarians differ but slightly from the regular Baptists; they are found principally in Pennsylvania. The Mennonites are confined almost exclusively to Pennsylvania, Ohio, Virginia, and New York. The Dunkers or Tunkers are found in the same states. The "Disciples," or followers of Alexander Campbell, also practise immersion, but are not usually reckoned among the Baptists; they are found mostly in Virginia, Kentucky, Ohio, Pennsylvania, Indiana, Illinois, and Tennessee. Only a small proportion of the Catholics are of American parentage, most of them being Irish, French, and German immigrants and their immediate descendants. The Protestant Episcopal Church is a prominent and influential denomination. Before the revolution it was the established church of New York and Virginia, and it is still one of the leading denominations in those states, as well as in Maryland, Connecticut, and Pennsylvania. Of the Presbyterian bodies the most considerable and wealthiest is the Old School Presbyterian Church, which has its largest membership in the middle, southern, and south-western states. The Protestant Reformed Dutch Church flourishes principally in New York and New Jersey; the German Reformed Church in Pennsylvania, Maryland, North Carolina, and Ohio; and the Lutherans, consisting mostly of German, Swedish, and Danish immigrants, in Pennsylvania, Ohio, New York, North and South Carolina, Virginia, Maryland, Indiana, Illinois, Missouri, and Wisconsin. The Congregationalists are divided into two bodies, the Orthodox or Trinitarian, and the Unitarian Congregationalists. The former are the leading denomination in the New England states, and have a considerable number of churches in New York and in each of the western and Pacific states, but very few elsewhere. The Unitarian Congregationalists are most numerous in Massachusetts, but have some large congregations, mostly in the cities and larger towns in Maine, New Hampshire, New York, Vermont, Connecticut, &c. The denomination taking the distinctive name of Christians, and found in nearly all the states, may be described as Unitarian Baptists, with a church government somewhat resembling that of the Methodists. The Universalists are mostly in the New England states. They are divided into two bodies, the Restorationists and the Universalists proper. The Friends or Quakers are divided into two bodies, the Orthodox or Trinitarian, and the Hicksite or Unitarian Friends. Of the sects not affiliated with the leading denominations, may be named the Moravians or United

Brethren in Christ, principally found in Ohio, Pennsylvania, and Indiana; the New Jerusalem Church of Swedenborgians, in Massachusetts, and in most of the large cities of the country; the Shakers, who have congregations in five or six states; and the Mormons, mostly in Utah territory, where they form an isolated community. Jewish congregations exist in most of the larger towns of the Union, the total number of Jews in the States being estimated at above 200,000. They consist principally of immigrants from Germany and Poland. The most important synagogues are those of New York, Philadelphia, Baltimore, Cincinnati, San Francisco, New Orleans, and Charleston.

The salaries of the clergy, though not as a rule large, generally, even in the smallest villages or rural districts, exceed those of a large proportion of the country curates of England, the priests of the smaller communes of France, or the lowest class of the clergy of Germany, Switzerland, and Denmark. The average salary of Congregational and Presbyterian ministers is said to be 700 dollars; of the Reformed Dutch and Episcopal clergy, about 600 dollars; of Baptist ministers, about 500 dollars; of Methodist ministers, 400 dollars; and of the Roman Catholic clergy, 500 dollars.

The system of public instruction in the States originated with the Pilgrim Fathers of New England, where, as early as 1628, provision was made for the education of "every child" in the settlements. In 1637 a school was ordered to be provided for every neighbourhood of fifty families, and another for a higher grade of instruction for every 100 families. A sum sufficient to maintain these schools was annually raised by a town tax, voluntarily imposed, and each district drew its proportion for its own school or schools.

The same system, with various modifications, has gradually extended itself to most of the states in the Union, and in part has been acted upon by the general government. Education in the north has thus become very generally diffused, and the number of native inhabitants of the New England states who cannot at least read and write is very small. In the middle states the large influx of foreign population, a considerable proportion of whom are indifferent to the education of their children, has made the proportion of uneducated persons somewhat greater. In the southern or planting states the population is too widely scattered to admit of successful public schools except in the cities. The negro population is necessarily characterized by the grossest ignorance, it having been, before the emancipation, a penal offence to teach negroes to read. In the western states ample provision is made for elementary education. In all the new states one, and in some of them two, sections of land (each of 640 acres) in each township of government lands are reserved for school purposes, and the states have also grants of swamp and other lands for school funds, and for the establishment of state universities. The people generally appreciate the advantages of this elementary education, and great sacrifices are often made to establish and maintain good and accessible schools. That these schools, even in those states which are furthest advanced, are as efficient or thorough in their education as they should be is not probable; but they have made very great improvement within the past twenty years, and are still advancing. In what is sometimes called secondary education, embracing a very wide range, from the select school or village academy, which is often mainly occupied with rudimentary studies, to the high school, institute, seminary, or collegiate school (so called), the number of establishments is, in the older states, sufficiently large, though in many of them the instruction might be improved. In the northern states the tendency is to the organization of graded schools, equal in their course of instruction and teaching to the best academies; three, four, or more gram-

mar-schools; and a still larger number of intermediate and primary schools, all supported by a tax on property and the allowance from the school fund. The pupil, entering the primary school at five or six years of age, may pass, by successive examinations, to the highest department; and there being no charge for tuition, the child of the poorest citizen enjoys the same opportunities of education, up to the completion of the high-school course, as the child of the rich. In some of the states this system is carried still further by the organization of free state universities. The greater part of the secondary instruction is, however, imparted in incorporated or private seminaries, academies, institutes, or collegiate schools, the price of tuition varying with the location, reputation, number of teachers, &c. Most of these schools are well conducted, and impart a thorough and judicious course of instruction. A few are universities, having connected with them departments for professional or scientific study, well supplied with the means of imparting instruction in law, medicine, theology, physical science, mathematics, &c. Several of the states have state universities, or institutions bearing that name, though not yet fully organized; but there is no national university. No denominational instruction is given in the public schools, but the Bible is generally read without note or comment.

In the other accessories of superior education, such as libraries, popular and scientific courses of lectures, scientific journals, &c., the United States, though necessarily far behind the older states of Europe, have made great progress within the past few years. There are about forty public libraries, containing from 30,000 to 100,000 volumes each. The scientific journals are ably conducted and well supported, and some of them have a high reputation abroad as well as at home.

The press in the United States exerts a very powerful influence. The greater part of the people read, and most families take at least one newspaper, and many take several, besides magazines. The religious newspaper press of the large cities is characterized by very high literary merits. There is also a local newspaper press, which exerts in the aggregate a considerable influence. The charitable and benevolent institutions in the United States are liberal and extensive.

*History.*—This great, powerful, and flourishing confederation, which seems destined to include within its boundaries the fairest regions of that New World which the genius of Columbus threw open to European colonization, originally consisted of thirteen provinces. These were colonized by English and foreign settlers in the following order:—

Original Provinces.	When Colonized.	By Whom.
1. Virginia, . . .	1607	The English.
2. New York, . . .	1618	The Dutch.
3. Massachusetts, . .	1620	English Puritans.
4. New Hampshire, . .	1623	English Puritans.
5. Delaware, . . .	1626	Swedes.
6. Connecticut, . . .	1633	{ Immigrants from Massachusetts.
7. Maryland, . . .	1636	{ Lord Baltimore and Roman Catholics.
8. Rhode Island, . .	1663	{ Immigrants from Massachusetts.
9. North Carolina, . .	1670	Virginian Settlers.
10. South Carolina, . .	1670	Virginian Settlers.
11. New Jersey, . . .	1670	Dutch and Swedes.
12. Pennsylvania, . .	1681	{ William Penn and Quakers.
13. Georgia, . . .	1732	{ General Oglethorpe and English.

The early annals of each of these states are briefly sketched under their respective heads. It is only needful to add, before entering upon their connected history, that slavery, if not actually introduced, was at least extended and established in the colonies by the English government, which, by the treaty of Utrecht in 1713, had obtained a virtual monopoly of the slave trade.

Their first beginnings gave but little indication of the unexampled prosperity to which they were, in less than a century and a half, to attain. They were hampered in their development by two persistent enemies—the Indians and the French. The former inflicted upon them severe losses, but were unable to crush the rising states; the latter, seated in Canada, availed themselves of every war between the mother countries to invade the barrier provinces of New York and New England, literally with fire and sword. It soon became evident that to secure the prosperous growth of the English colonies the French must be dispossessed, and in 1745 they suffered their first great loss in the capture of Louisburg, which supplied the British forces with a convenient position for operating against Canada. The struggle continued for twenty years, with occasional gleams of good fortune for the French, but with a steady advance on the part of the British, who successively made themselves masters of Ticonderoga, Crown Point, Niagara, and Fort Duquesne (now called Pittsburg). But the greatest achievement was the victory of Wolfe on the Heights of Abraham (1759), succeeded by the fall of Quebec. The year 1760 came, and still triumph followed triumph. Montreal was captured; the whole province of Canada was subjugated; and the French power ceased to exist on the river St. Lawrence.

Thus relieved from the pressure of an energetic enemy, and protected by their own increased strength against Indian forays, the States made so rapid progress in wealth and substantial greatness that in a few years the mother country began to look to them for some degree of assistance in bearing the burdens which she had partly incurred in their behalf. On the other hand, the colonists, animated by a true Anglo-Saxon love of independence, frequently chafed against the commercial policy of the sovereign power; and especially after the peace of 1763, when the attempt to carry out our Navigation Laws, by a rigid prohibition of the contraband trade of the American with the Spanish colonies, produced the liveliest discontent. The trade between Great Britain and her colonies, remarks an accurate writer, had been always based upon principles wholly opposite to those of commercial freedom. The Englishman was forbidden to smoke any other than Virginian-grown tobacco, and the Virginian could wear no other coat than one of English-made cloth. Under an external appearance of loyalty and good feeling, therefore, much angry dissatisfaction prevailed. An open quarrel, however, might have been avoided for many years but for the Stamp Act of 1765—a measure to raise £60,000, which produced a war-outlay of £100,000,000.

“What mighty contests rise from trivial things!”

By this Act certain stamp duties were imposed upon the American colonies, to come into operation on the 1st of November. The Act was little understood in England at the time, and passed with scarcely any opposition. But in America it fanned into a flame the flickering embers of discontent. The colonies were not represented in the British Parliament; what right, then, had that Parliament to tax them without their consent? The State of Virginia particularly distinguished itself by its vehement denunciations of the policy of the British government, and these denunciations lost none of their effect when couched in the eloquent language of Patrick Henry, a member of the Virginian Assembly, and an orator of considerable power.

Our limits will not permit us to trace the gradual pro-

cesses of arbitrary rule on the one hand, and bitter jealousy on the other, which eventually terminated in an armed conflict. Resistance to Britain united the different colonies by a common bond, and the first colonial congress of twenty-eight delegates, representing nine colonies, drew up an indignant statement of their grievances and declaration of their rights. The Stamp Act was repealed in 1766; but the mother country still claimed the right of taxing her dependencies, and in 1767 duties were levied upon glass, red and white lead, paper, painters' colours, and tea. These duties were not to be collected until the 20th of November. That day passed over in tranquillity in Boston; but the inhabitants had previously assembled and resolved to forbear the use of many articles of British produce or manufacture. In 1768 the aspect of affairs was so threatening that a large body of troops, with artillery, was encamped near Boston. The spirit of resistance, however, continued active, and spread from Massachusetts over all the provinces. Some attempts at conciliation were made by the British government, who repealed all the duties except that on tea; but it was against the principle of taxation without representation that the colonists were contending, and they held the one duty to be as effectual a badge of slavery as half a dozen.

Meanwhile, blood was being shed. An encounter took place between the citizens of Boston and the military on the 8th of March, 1770. Three persons were killed and eight wounded. It was a street squabble in which both parties were almost equally to blame, but in the excited state of public feeling it was exaggerated into “a massacre.” The stream was rapidly gathering in force and volume, and was soon destined to overthrow every constitutional barrier. On the night of the 16th of December, 1773, a body of Bostonians seized upon three ships loaded with tea from England, then lying in Boston harbour, and deliberately emptied their cargoes into the waters of the bay. It was the work of three hours; but it was also the opening scene of a war which lasted six years, and whose evil consequences are apparent even in our own day.

To chastise this overt act of rebellion the British government declared Boston no longer a port of entry, and transferred its commerce to Salem, while at the same time it took vigorous measures to assert the supremacy of the crown. A powerful fleet and a body of 10,000 troops were despatched to America. The colonists prepared to resist what they considered the tyranny of the mother country, and drilled with indefatigable ardour, unimpeded by the colonial authorities. The first contest between the two parties took place at Concord, near Lexington, on the evening of the 18th of April, 1775, when a British detachment was defeated by a large body of the colonists, with a loss of 200 or 300 in killed, wounded, and prisoners. Almost simultaneously the forts of Ticonderoga, on Lake George, and Crown Point, on Lake Champlain, both very inadequately garrisoned, were surprised by the Connecticut volunteers. Thus committed to a deadly struggle with Great Britain, the colonists hastily organized a civil government, and a congress of all the states assembled at Philadelphia, which resolved to levy and equip an army of 20,000 men, and appointed GEORGE WASHINGTON to the supreme command.

On the 17th of June Bunker's Hill, near Boston, where an American brigade 1000 strong had entrenched themselves, was attacked and stormed by the British, under Sir William Howe, but with so severe a loss as greatly to discourage the royalists, while it stimulated the spirits of the colonial soldiery. Even at this time, had the policy of Great Britain been directed by a wise and patriotic statesman, peace might have been secured; or had her arms been guided by a general of vigour and ability, submission might have been enforced. But Lord North's government

was as incapable of statesmanlike views as his commanders were of any well-designed plan of military and naval operations.

Notwithstanding the remonstrances and warnings of some of the leading English statesmen, the government now determined on crushing by force what they were pleased to designate as the unwarrantable rebellion of the American colonists. In this course of action they were supported by all the influence of the king, whose views of public policy were of the narrowest description, and coloured by a strong tinge of absolutism. Troops were poured into America to the number of 55,000, including 17,000 German mercenaries, with immense supplies of war material. The chief command was intrusted to Sir William Howe, a brave and conscientious officer, but wholly undistinguished by any original military genius.

The Americans on their part prepared for a desperate resistance. They proceeded to levy and equip a considerable army, and appointed General Washington their commander-in-chief. That able and disinterested patriot lost no time in commencing operations. In July, 1775, he undertook the siege of Boston, which the British evacuated in the following March after a stout resistance, and, embarking on board their fleet 1500 "loyal" families sailed for Halifax. But as a counterpoise to his success, which moreover had cost Washington half his army, an expedition undertaken by the Americans in two divisions against Canada, failed with severe loss, and their General Montgomery was killed, and General Arnold wounded, before Quebec.

On 4th July, 1776, the Congress took the irrevocable step of declaring the colonies free and independent, and absolved from all allegiance to the British crown. The celebrated Declaration of Independence, written by Thomas Jefferson, and based upon the principle that "all government derives its just powers from the consent of the governed," was signed by the delegates of the different states on the same day. Soon afterwards these states adopted constitutions of their own, and organized state-governments, which, in their leading features, have continued to the present day.

In the following August Sir William Howe, with 21,000 British troops, landed on Long Island, about 9 miles from New York, where Washington was lying with a force 17,000 strong. The British general defeated the Americans in a sanguinary battle (27th August), and on the 11th of September Washington evacuated the island, of which the British took immediate possession. On the 12th of November they captured Fort Washington, with its garrison of nearly 3000 men, which was soon afterwards followed by the capture of Fort Lee, on the Jersey shore. Newark, New Brunswick, and the principal towns in New Jersey, fell one after another before the British arms; and had the British commander possessed the genius of a Wolfe or a Wellington, the rebellion must have been crushed in its infancy, and the independence of the states, to the great loss of England herself, been delayed another generation.

But while these disasters were occurring on the Atlantic coast, a gleam of success in the west roused the drooping spirits of the colonists. General Burgoyne, at the head of 7000 British and German troops, with a large force of Canadians and Indians, invaded the colonial territory from Canada, with the view of penetrating into New York, and uniting with Howe on the Hudson, and breaking up the confederacy into two disunited bodies. After capturing Ticonderoga, with its garrison of 3000 men, and overcoming the numerous obstacles thrown in his way by a persevering enemy, he was encountered at Saratoga by a large force under Generals Gates and Arnold. Here, on the 19th of September, a sharp encounter took place, which left the British masters of the field. But the Americans

were so strongly posted that Burgoyne deferred any general attack until the expedition from the Hudson advanced to his succour. He therefore entrenched himself at Saratoga, and awaited the expected diversion in his favour to be made from New York. Here, however, he found himself in great danger of famine; his stores were nearly exhausted; the country was drained of forage and provisions; and while the American army was constantly being reinforced, his own was seriously diminished by the desertions of the Indians and Canadians. In this strait Burgoyne at length resolved on a supreme effort to dislodge the Americans from their position, that he might gain the means of resuming his onward march. At the very time that he came to this fatal resolution, Sir Henry Clinton, with a powerful British force, had successfully advanced to within 160 miles from Burgoyne. But the British generals were unaware of each other's movements, and on the 7th, Burgoyne, with only 6000 men, attacked the American entrenchments. The battle was obstinate and sanguinary, but attended with no more direct result than to compel a change of position on the part of the British, which was successfully effected. There, hemmed in by the enemy, who declined a second encounter, and baffled in all his attempts to strike out a path of escape, the brave and unfortunate Burgoyne lingered, until famine compelled him to capitulate on the 15th of October. On that very evening a messenger arrived from Clinton with an account of his continued successes, and with the tidings that part of his force had penetrated as far as Esopus, within 50 miles of Burgoyne's camp. But it was too late. The convention was signed, and on the 17th carried into effect.

It proved to be the turning-point of the war. It emboldened the French government to accept the overtures made by the American states, and in February, 1778, a treaty was signed by which France acknowledged the Independent United States of America. This was, of course, tantamount to a declaration of war against England, and as England had given the French government no offence, was an act of perfidious policy justly punished, a few years later, by the Revolution—a revolution largely fomented by the American principles of equality and liberty, and encouraged by the success of the American rebellion. Louis XVI. and his ministers sowed the wind and reaped the whirlwind.

Though engaged at home in a desperate conflict with France, Spain, and Holland, Great Britain continued for some years her attempts to reconquer the revolted colonies; and that she was unsuccessful resulted rather from the incompetence of her generals than from the assistance rendered to the colonists by the French, or the vigorous exertions of the colonists themselves. The British troops were successful on almost every battlefield; but the victories won by their courage were neutralized by the incapacity of their commanders, who seemed unable to form any definite or combined plans of action, and frittered away their resources in attacks upon isolated points, where success was not worth having, because it produced no result on the general course of events. At length, Lord Cornwallis with an army of 17,000 men found himself shut up at Yorktown, blockaded by a French fleet under the Comte de Grasse, and besieged by a largely superior force of French and Americans. On the 19th of October, 1781, he was compelled to surrender. From this blow the British never recovered. The government at home, pressed by the feeling of the country, relinquished the unequal struggle; negotiations were opened with the Americans, and the independence of the colonies acknowledged by a treaty signed 13th September, 1783.

The States had thus conquered their freedom, but they found themselves hampered with a foreign debt of 8,000,000 dollars, a home debt of 30,000,000 dollars, a discontented army clamouring for arrears of pay, a bankrupt treasury.

and a worthless paper currency. So great was the exhaustion, so complete the disorganization, that the historian may reasonably doubt whether, if the struggle had lasted another twelvemonth, the Americans would not have been forced to succumb. Their leading statesmen, however, addressed themselves with vigour to the reorganization of the government. Delegates were summoned from all the states in 1787 to determine a new constitution, which is still the foundation of the American executive power and the guarantee of state-rights and individual liberties. Through the efforts of Hamilton, Jay, and Madison it was finally adopted by all the states, though by some with great reluctance. Two parties arose, the Federalists and the anti-Federalists, the latter contending for the sovereign rights of the states as independent of the central executive; but the former, headed by Washington and John Adams, proved successful. George Washington was elected first president of the United States in 1789, and John Adams first vice-president. Thomas Jefferson was appointed secretary of state; Alexander Hamilton, secretary of the treasury; General Knox, secretary of war; and John Jay, chief justice of the Supreme Court. Thus did the United States enter upon their career as an independent and sovereign nation, destined to an almost unlimited expansion and a career of the most extraordinary prosperity. It would be wrong, however, to attribute that prosperity to any superior excellence in its mode of government, or to any other than its true causes—the innate energy and industry of a people of British origin, and an immense virgin territory, whose resources it will take years to develop and centuries to exhaust.

During the great wars of the French Revolution and the Napoleonic Empire, the United States remained neutral, though a large party did not hesitate to give constant expression to the hostile feelings with which they regarded Britain, the great champion of the liberties of nations, and seized every opportunity of vilifying her conduct and disparaging her exertions.

Washington, after being re-elected to the presidency in 1792, retired from active life in 1796, and was succeeded by John Adams. In 1799 the death of Washington called forth the regrets of all classes of his countrymen, and in the following year the seat of government was removed to the city which he had selected for the capital, and which was named after him in commemoration of his virtues and services. Thomas Jefferson was elected president in 1801, and under his rule the United States made rapid progress. Tennessee, Vermont, Maine, and Ohio were admitted into the Union, which was greatly increased in area and resources in 1803 by the purchase of Louisiana from France for 15,000,000 dollars. In 1805 Jefferson was re-elected president. He declined the honour when offered to him a third time in 1809, and James Madison was nominated in his place. Considerable ill-feeling had now arisen between the American and British governments, owing to the right of search of neutral ships claimed by the latter, and at length this irritation culminated in a declaration of war issued by the United States, 18th June, 1812.

The British government, perhaps undervaluing their opponents, and at all events engaged in a life and death struggle with Napoleon, and half Europe at his back, entered upon hostilities in no very energetic spirit. The stress of war which they fitted out against the Americans was ill-fitted to contend with their far more powerful vessels, and consequently the maritime supremacy of Great Britain seemed for a time in danger of becoming a thing of the past.

The American victories at sea were, however, entirely due to a preponderating superiority of force. Their frigates were, in reality, men-of-war, with which the British frigates could not cope on anything like terms of equality. But when the British government gradually

became aware of this serious fact, and despatched heavier armed ships into the American waters, our seamen soon vindicated their ancient renown.

Meanwhile, the war had been prosecuted on land with varying fortune. Two invasions of Canada were defeated by the British, but in 1812 the campaign on the lakes was in favour of the Americans, and the British squadron on Lake Erie, of six vessels and sixty-three guns, was captured by Commodore Perry, with a flotilla of nine vessels and eighty-four guns. In 1813 another attempt at invading Canada proved unsuccessful. In 1814 Generals Scott and Ripley crossed the Niagara, and two sharp but indecisive actions took place at Chippewa and Lundy's Lane. A British invasion, by Lake Champlain, under General Sir George Prevost, with 14,000 men and a flotilla on the lake, was defeated with severe loss. On the other hand a British fleet ascended the Chesapeake, defeated the Americans at Bladensburg (14th August), captured Washington and destroyed its public buildings (24th August), but failed in a subsequent attack on Baltimore (12th September). An expedition against New Orleans, headed by General Packenham, was repulsed with a loss of 700 killed and 1000 wounded, owing to the incompetency of the arrangements and the headstrong arrogance of the authorities, which resulted in entangling the British force in a fatal ambuscade (8th January, 1815). Neither party in this fratricidal war can be said to have gained much glory, and in the United States a large body of citizens felt its folly and deplored its disasters. The New England states threatened a secession if the struggle, which, owing to the vast superiority of the British navy, proved ruinous to American commerce, were not terminated, and as public opinion in England was scarcely less favourable to peace, a treaty was concluded between the two governments in December, 1814. The news, however, did not reach America in time to prevent the calamity at New Orleans.

In 1817 James Monroe was elected president; and about this time commenced that enormous annual emigration to the States which has enabled them to attain such colossal proportions in so short a period, and which has extended their territory westward to the foot of the Rocky Mountains, and southward to the frontiers of Mexico. In two years six new states were added to the Union. A quarrel with Spain, originating in the support lent to the Seminole Indians by the Spanish authorities, resulted, in 1819, in the cession of Florida. In 1820 Alabama, a slave state, and Maine, a free state, were incorporated; and from this epoch may be dated the growth of that great struggle between the Southern States, as representing slavery, and the northern and middle, as identified with freedom and free labour, which was finally terminated by the Civil War. As each incorporation of a slave state increased the slave influence in Congress, the struggle to maintain the balance of power was being perpetually waged. To this it must be added that the slave states were agricultural, and consequently advocates of free trade; the free states, manufacturing and commercial, and champions of protection. Thus the two great divisions of the Union were animated by directly opposite principles, and contended for hostile interests, almost as if they were two alien nations. A kind of compromise was established in 1820, on the admission into the Union of the slave state Missouri, and it was provided that no slave state should thereafter be erected north of the parallel 36° 30' N. lat., the northern boundary of Arkansas.

Mr. Monroe was a second time elected president in 1820, and it was during this period that he promulgated the well-known "doctrine" that bears his name. [See MONROE.] In 1824 he retired, and was succeeded by John Quincy Adams, with John C. Calhoun, an eloquent pro-slavery statesman and a Southerner of great ability, as vice-president. The struggle between the Republican and the



Democratic parties, as they were strangely and inconsistently called, continued throughout his term of government; but the Democrats triumphed at the presidential election of 1828, and carried their candidates, General Andrew Jackson, the "hero of New Orleans," and John C. Calhoun, as respectively president and vice-president.

General Jackson was a vigorous ruler, and his popularity secured for him a second lease of office in 1832, with Martin Van Buren as vice-president. In 1837 the latter rose to the presidency, which was distinguished by his firmness, moderation, and dignified policy. He incurred much unpopularity among the noisier classes of politicians by refusing to show any sympathy with the Canadian insurgents in 1837-38, and in 1840 gave place to General Harrison as the representative of Whig principles. Fatigue and excitement proved fatal to the new president in a month after his election, and he was succeeded by the vice-president, John Tyler. During his period of government a serious difficulty arose with England on the Oregon boundary question, but it was amicably settled through the exertions of Daniel Webster, the American secretary of state, and Lord Ashburton, the British commissioner. A treaty defining the boundaries between the British and American territories, suppressing the slave trade, and providing for the extradition of fugitive criminals, was signed at Washington, 9th August, 1842.

Internal struggles next called for the president's attention. Texas, largely colonized by American settlers, revolted against Mexico, and asserted its independence, which was acknowledged by France, England, and the United States. It soon afterwards demanded admission into the Union. Its appeal was strongly supported by the Southern States, because its annexation would strengthen the influence of the pro-slavery party; and strongly opposed, for the same reason, by the Northerners, who also saw that it would involve a war with Mexico. The lust of territory, which seems the besetting sin of the great republic, finally prevailed. In 1845 Texas was formally annexed, war was declared by Mexico, and James Polk, of Tennessee, succeeded Mr. Tyler in the presidency.

The Mexicans crossed the Rio Grande, and commenced hostilities on the 26th of April. They were promptly encountered by the American army, under General Zachary Taylor, who pushed forward with equal vigour, celerity, and success, defeating the Mexicans at Palo Alto, Monterey, and Saltillo, and finally, with 4759 men against 20,000, winning the desperate battle of Buena Vista, 22nd and 23rd February, 1847. An expedition under General Scott landed at Vera Cruz, which was taken by storm on the 29th of March, and on the 18th of April General Santa Anna, the Mexican leader, with 15,000 men, was defeated by General Scott and his 9000 troops with heavy loss. This was followed by the victories of Contreras (19th August) and Churubusco (20th August), and the capture of Mexico (9th September), which terminated the war. A treaty of peace was signed on the 29th of May, 1848, by which the United States obtained the cession of New Mexico and Upper California. But the acquisition of these territories increased the vehemence of party feeling throughout the Union, the North loudly demanding that slavery should not be introduced where it had not previously existed. In the presidential election of 1849 the South, however, succeeded in carrying General Taylor as president, and Millard Fillmore as vice-president, and the political struggle grew so violent as to menace a disruption of the Union. General Taylor died in 1850, and was succeeded by Mr. Fillmore, under whom the South contrived to pass the Fugitive Slave Act, providing for the rendition of slaves who escaped into the free states.

The South won another triumph in 1852, when Franklin Pierce was appointed president, and Jefferson Davis, a prominent pro-slavery politician, secretary of war. The

repeal of the Missouri compromise, and the debates relative to the admission of Kansas into the Union, inflamed the bitter feeling already existing between the two great factions, and led to many deeds of violent outrage. Some attempts were made by the government to divert the current of public opinion by fomenting little quarrels with Great Britain, as in 1852; again in 1856, during the Crimean War, when Mr. Crompton, the British ambassador, was dismissed; and in 1859, on the Vancouver Island question: but the moderation of Great Britain, and the good sense of the more enlightened classes in the States, prevented these difficulties from terminating in war.

Meanwhile, the struggle between North and South continued to increase in force and intensity. Though the power of the latter seemed paramount when, in 1856, two well-known pro-slavery men, James Buchanan and John C. Breckenridge, were respectively elected president and vice-president; yet from this time it became evident to many sagacious and far-seeing politicians that the quarrel between the two divisions of the Union could only be settled by the arbitrament of arms, or by the secession of one of the hostile factions. The angry feeling was raised to blood-heat in December, 1859, by the execution of John Brown, at Harper's Ferry, for his share in an expedition for freeing the slaves in Virginia. Though he was unquestionably an insurgent in arms against the lawful government of his country, the abolitionists regarded him as a martyr in a high and holy cause, and honoured his body with a public funeral.

The year 1860 opened stormily, and both parties prepared for a grand trial of strength at the approaching presidential election—a trial which should be regarded as a definite conclusion of the struggle of half a century. It was about this time (September and October) that the Prince of Wales visited the States, where he was received with a very cordial and enthusiastic welcome.

The election took place on the 6th of November, and resulted in the triumph of the North: Abraham Lincoln was named president, and Mr. Hamlin vice-president. The South immediately acted upon the menace it had previously addressed to the North, and withdrew from the Union; the examples set by South Carolina, on the 20th of December, being followed by Mississippi, 8th January, 1861; Florida, 10th January; Alabama, 11th January; and Georgia, 19th January. They were joined at a later period by Virginia, North Carolina, Tennessee, and Arkansas. Kentucky and Missouri were divided between the contending sections.

On the 14th of February delegates from Alabama, Florida, Mississippi, Georgia, Louisiana, and Texas met at Montgomery, and formed a provisional government, under the title of the Confederate States of America. Jefferson Davis, of Mississippi, was elected president, and Alexander H. Stephens, of Georgia, vice-president. President Davis immediately prepared for war, and blockaded Fort Sumter, in Charleston Harbour.

In his inaugural address, 4th March, 1861, President Lincoln declared that the accession of a republican administration afforded no ground to the Southern States for apprehending any invasion of their rights, and that the power confided to him would be used "to hold, occupy, and possess the property and places belonging to the government, and collect the duties and imposts; but beyond what may be necessary for these objects, there will be no invasion, no using of force against or among the people anywhere." "The course here indicated will be followed, unless current events and experience shall show a modification or change to be proper."

The army at the beginning of active measures on the part of the South was only 16,000 strong (on 1st January, 1861, it consisted of 16,402 officers and men, of whom 14,657 were present for duty), and by orders from Mr.

Floyd, the secretary of war, who was himself a party to the secession movement, had been dispersed in the remotest parts of the country, while the navy was mostly absent on foreign stations. Under Floyd's orders also an extensive transfer of arms and ammunition from northern to southern arsenals was made during 1860. Before the inauguration of Mr. Lincoln, General Twiggs, commanding in Texas, had surrendered to the Texan authorities half the military force of the Union. Most of the army and many of the navy officers from the South resigned upon the secession of their states. The first warlike act was the bombardment by the Confederates, under General Beauregard, of Fort Sumter, which was commanded by Major Anderson with a garrison of 109 men. Fire was opened on 12th April, 1861, and continued on the 13th, and Major Anderson was compelled to evacuate the fort on the 14th, sailing with his garrison to New York. The next day (15th April) President Lincoln issued a proclamation calling upon the governors of the several states for a force of 75,000 militia for three months. The utmost enthusiasm was aroused throughout the North.

On 13th May, General B. F. Butler took military possession of Baltimore, repressing the secession element in that city. In the mean time the United States arsenal at Harper's Ferry (18th April), and the Gosport navy yard, near Norfolk (21st April), fell into the hands of the Confederates. On 19th and 27th April the president issued proclamations declaring a blockade of the ports of the seceded states. On 15th April he called an extra session of Congress to meet on 4th July. This body made large appropriations for the organization and support of the army and navy, which were continued by subsequent congresses. Various loans were authorized and other financial measures adopted during the struggle, to which reference has been made in a previous portion of this article. The states and subordinate political bodies also promptly raised large sums in aid of the war, and did not relax their efforts till its close. Bounties were offered to soldiers enlisting by the United States and by state and local authorities. On 3rd May, 1861, a second call was made by the president for 42,034 volunteers for three years, 22,714 men for the regular army, and 18,000 seamen. The Acts of 22nd, 25th, and 31st July authorized the president to accept not exceeding 1,000,000 volunteers for periods of from six months to three years. No formal call was made, but men came forward promptly under these Acts, which were regarded in the apportionment of quotas as a call for 500,000 men for three years. Simultaneously with the organization of the army measures were taken to enlarge the navy, which for service against the Confederacy was largely recruited by the purchase of steamers and other vessels from the merchant marine. On 24th May, 1861, the national forces took possession of Arlington Heights and Alexandria on the Potomac, opposite Washington. On the 27th Federal troops under General McClellan entered Western Virginia. They soon obtained control of that part of the state, and at the close of the year scarcely any armed Confederates were found west of the Alleghanies in Virginia. On 21st July was fought the battle of Bull Run, near Manassas Junction, Virginia, the first of any magnitude during the war, in which the Union forces under General McDowell were defeated by the Confederates under General Beauregard, and fell back in disorder to Washington. Soon after General McClellan was placed in command of the army of the Potomac, and began to reorganize and discipline his forces, in which occupation the rest of the summer and the following winter were quietly passed. On 29th August Forts Hatteras and Clark, at Hatteras Inlet, the main entrance to Pamlico Sound on the coast of North Carolina, were taken by a military and naval expedition under General Butler and Commodore Stringham. On 29th

October a fleet of seventy-five vessels, under command of Commander Du Pont, with transports conveying 10,000 men under General T. W. Sherman, sailed from Hampton Roads, and on the night of 3rd November arrived off Port Royal, South Carolina. On the 7th they attacked Forts Beauregard and Walker, at the entrance of the harbour, and after a bombardment of nearly five hours put the garrison to flight, thus securing the finest harbour on the southern coast. Meantime troops in aid of the Confederacy had been organized in Missouri, and others had come in from Arkansas and Texas, and their forces obtained several minor successes, but on 1st October the Confederate army before Washington began to fall back, and the national lines to be pushed forward. On the 21st a portion of General Stone's command, having crossed the Potomac at Ball's Bluff, about midway between Harper's Ferry and Washington, was disastrously defeated by the Confederate General Evans, with a loss of 1000 out of 1900 men. On 31st October Winfield Scott, general-in-chief of the armies of the United States, retired from active service, and was succeeded by General McClellan. On 8th November Captain Wilkes, in command of the frigate *San Jacinto*, intercepted the British mail steamer *Trent*, from Havanna for Southampton, and forcibly took from on board Messrs. Mason and Slidell, commissioners from the Southern Confederacy to England and France. The action was resented by the British government, and produced a great display of feeling against the United States. A war with England seemed imminent, when the president decided to surrender the commissioners to the British minister. On 6th February, 1862, the Federal Commodore Foote, with a fleet of gunboats from Cairo, reduced Fort Henry, on the east bank of the Tennessee River, in Tennessee; and on the 16th Fort Donelson, on the west bank of the Cumberland, surrendered with about 13,000 men, after some severe fighting, to General Grant. Nashville, Tennessee, was occupied by the Federal forces on the 26th, and on 2nd March Columbus, Kentucky, was evacuated by the Confederates. The whole of Kentucky and a part of Tennessee were thus secured by the Federal arms. To command the Mississippi the Confederates had fortified island No. Ten in a sharp bend of that river, a few miles above New Madrid, which was also fortified and defended by a Confederate force. On 3rd March General Pope invested the town, which he took possession of on the 14th, the Confederates having abandoned it during the preceding night, leaving thirty-three guns and a large quantity of small arms, ammunition, &c. Commodore Foote having in the meantime moved a fleet of gunboats down the river, opened on the island on the 15th. Two of the gunboats succeeded in running past it; and a canal 12 miles long having been cut through a peninsula on the Missouri side, enabling the fleet to get below it, General Pope on 7th April crossed a portion of his troops to the east side. The Confederates, thus cut off from retreat, surrendered during the following night, and nearly 7000 prisoners, 123 cannon, 7000 stand of small arms, and an immense quantity of stores fell into the hands of the Federals. The Federal fleet proceeded down the river, and after some opposition from forts and gunboats received the surrender of Memphis on 6th June. The command was now devolved on Commodore Davis, Commodore Foote having been disabled by a wound. The fleet continued its course down the river, reaching Vicksburg, Missouri, before the end of June, where the first serious obstacle was encountered. In the meantime the Federal forces under General Grant had advanced from Fort Donelson up the Tennessee River, and when encamped in the vicinity of Shiloh Church, Tennessee, near Pittsburg Landing, on the river, were attacked by the Confederates under Generals A. S. Johnston and Beauregard, who had advanced from Corinth, about 20 miles distant. The battle, which at first threatened to overwhelm the Federals, raged



two days (6th and 7th April), when the Confederates fell back to Corinth, leaving the field in the possession of the Union army. After the battle General Halleck assumed command of the Union army, and with augmented forces operated against Corinth, which the Confederates evacuated on 29th May. About the same time General Mitchell entered North Alabama, capturing Huntsville and other points, and destroying much Confederate property. A Confederate force had entered New Mexico from Texas early in 1862, but they were driven out before the close of the spring, and subsequently that territory was unmolested. During the latter half of the year there were numerous conflicts in Missouri and Arkansas between small forces of Confederates and Federals, the advantage being in favour of the latter.

Ship Island, about 10 miles from the coast of the Mississippi, had been occupied in the latter part of 1861, and here troops were collected for the capture of New Orleans, to be under the command of General Butler, who reached the island on 25th March, 1862. New Orleans was defended by Forts Jackson and St. Philip, on opposite sides of the Mississippi, about 83 miles below the city. Both of these works were of great strength, and between them the passage had been barred by chains and hulks. On 18th April a bombardment was commenced by a Federal fleet of forty-seven vessels, carrying 289 guns and 21 mortars, the whole commanded by Captain Farragut, the mortar fleet being under the special command of Captain Porter. On the morning of the 24th, the barriers having been previously removed, Captain Farragut ran past the forts with a part of his fleet, destroyed a squadron of the enemy's rams and gunboats, silenced the batteries above the forts, and reached New Orleans on the 25th. General Lovell, in command of the Confederate troops, evacuated the city on his arrival, and destroyed all the cotton, sugar, and other valuable stores. Forts Jackson and St. Philip surrendered to Captain Porter on the 28th. General Butler now moved up with his army, took formal possession of New Orleans (1st May), and placed it under martial law. Farragut's fleet passed up the river, captured Baton Rouge, and afterwards proceeded to Vicksburg, the only remaining stronghold of the Confederates on the Mississippi, of which a bombardment was begun on 26th June. On the morning of the 28th Captain Farragut with seven vessels passed the city, and joined Captain Davis's flotilla from Memphis. The siege of Vicksburg was abandoned about the end of July, Captain Farragut, who had re-passed the batteries, dropping down the river with his fleet. On 8th March the Confederate ironclad *Virginia* (formerly *Merrimac*) coming out from Norfolk, attacked the Federal fleet in Hampton Roads, and destroyed the frigates *Cumberland* and *Congress*. During the ensuing night the ironclad *Monitor*, under command of Lieutenant Worden, arrived from New York, and in the morning engaged the *Virginia*, which retired after a protracted contest.

Operations of greater magnitude had in the meanwhile taken place on the eastern theatre of the war. About 1st April, 1862, General McClellan, who now had command only of the department of the Potomac, transferred his forces to Fortress Monroe, and began a movement upon Richmond up the peninsula between the York and James rivers. On the 4th an advance was made upon Yorktown, which was besieged for a month, when it was abandoned by the Confederates. McClellan then continued his advance, and a series of bloody battles was fought—viz., at Williamsburg, 5th May; Hanover Court House, 27th May; Seven Pines and Fair Oaks, 31st May and 1st June; Mechanicsville, 26th June; Cold Harbour, 27th June; Savage's Station, 29th June; Frazier's Farm, 30th June; and Malvern Hill, 1st July, on the James. During the night of 1st July General McClellan withdrew his troops to Harrison's Landing, 7 miles below Malvern Hill, where

he remained till about the middle of August, when his army was transferred to the Potomac. The Confederate army in this campaign was at first commanded by General Joseph E. Johnston, who was succeeded by General Robert E. Lee. Soon after the battle of Malvern Hill it retired to Richmond to assume the offensive against Washington. In the meantime a Confederate force under General "Stonewall" Jackson and Federal forces under Generals Banks and Fremont had been operating in the Shenandoah Valley. Several battles were fought, and about the middle of June Jackson was summoned with the greater part of his force to Richmond. In July General Pope was placed in command of the Federal army of Virginia, consisting of the forces that had been operating in the valley and of those under General McDowell covering Washington. About the same time General Halleck was summoned from the west to act as general-in-chief at Washington. On 9th August a portion of Pope's army under Banks was repulsed with loss at Cedar Mountain, near Culpepper Court House, by a superior body of Confederates under Jackson, who formed the van in Lee's offensive operations. On 29th and 30th August occurred the second battle of Bull Run, between the Union army under Pope and the Confederate forces under Jackson and Longstreet, in which the latter had the advantage. Pope retreated within the defences of Washington and resigned, General McClellan assuming command of the remnant of his army. Lee moved to the Potomac above Washington and crossed into Maryland. McClellan soon started to meet him, and encountered portions of the enemy on 14th September at Turner's and Crampton's Gaps in the South Mountain, from which they were driven after severe fighting. The next day Harper's Ferry, with 11,583 men, 73 guns, 13,000 small arms, and other stores, was surrendered to a detachment of Lee's army under Jackson. McClellan having found Lee on the 15th strongly posted across Antietam Creek, near the village of Sharpsburg, where on the two following days a bloody but indecisive battle was fought. On the night of the 18th Lee retreated into Virginia. McClellan crossed the Potomac about 1st November, and advanced to Warrenton, near the Rappahannock. On the 7th he was directed to turn over the command to General Burnside, who moved down the Rappahannock to Fredericksburg, which was summoned without effect on the 21st. Lee had made a parallel movement down the south bank of the river, and strongly intrenched himself on the bluffs behind the town. On 13th December Burnside crossed the river and made repeated attacks on the enemy's position, but was repulsed with great slaughter, and on the 15th returned to the north bank. On 26th January, 1863, Burnside was superseded by General Joseph Hooker. About the close of April Hooker began to cross the Rappahannock, and concentrated his forces at Chancellorsville, where a bloody engagement ensued (2nd to 4th May), in which the Union army was worsted by the forces under Lee, Hooker recrossing to the north side of the river. In this battle Jackson was mortally wounded. About the beginning of June Lee, again assuming the offensive, advanced into the Shenandoah Valley, capturing Winchester on the 15th, whence he drove a Federal force under General Milroy, taking many prisoners. The main body of the Confederate army crossed the Potomac above Harper's Ferry, 24th to 25th June, and marching across Maryland entered Pennsylvania. Hooker had begun on 13th June to move north, so as to cover Washington, and on the 26th crossed the Potomac about half-way between Washington and Harper's Ferry, advancing to Frederick. On the following day he resigned his command in consequence of a difference with General Halleck respecting the disposition of a force at Maryland Heights, opposite Harper's Ferry, and on the 28th was succeeded by General Meade. The latter advanced into Pennsylvania, and on 1st, 2nd, and 3rd July

the two armies met in the great battle of Gettysburg, which ended in the discomfiture of the Confederate army. On the 4th Lee began his retreat, and on the 13th recrossed the Potomac at one of the points where he had crossed on his advance. Meade crossed a little below Harper's Ferry on the 18th, and reached Warrenton on the 25th, where he was soon confronted by Lee on the other side of the Rappahannock. Few important movements were made by either army during the remainder of the year, and the campaign of 1863 closed with the abortive attempt of Meade upon Lee's position on Mino Run, a small affluent of the Rapidan, at the end of November.

About 20th December, 1862, General W. T. Sherman, with 30,000 men, proceeded down the Mississippi from Memphis, and on the 29th assaulted the fortifications and batteries commanding Vicksburg from the north. The assault was repelled with a loss of nearly 2000, and the forces a few days after were withdrawn to Milliken's Bend, where on 4th January, 1863, General McClellan assumed command. An expedition into Arkansas was immediately undertaken for the capture of Fort Hindman at Arkansas Post, on the Arkansas River, which was reduced on the 11th, the Federals suffering a loss of 977 men and capturing seventeen guns, several thousand prisoners and small arms, and a large quantity of munitions and stores. Returning from this expedition, the forces were moved down the Mississippi, and on the 22nd landed at Young's Point on the west bank, about 9 miles above Vicksburg, where General Grant arrived and assumed chief command, 2nd February. Two months were now spent in unavailing attempts to flank the defences of Vicksburg by means of a canal at this point and through various bayous. Finally, a part of Admiral Porter's fleet and several transports having run past the batteries of Vicksburg and Warrenton and Grand Gulf below, a portion of Grant's army, which had marched down the west bank of the Mississippi, crossed the river on 30th April. Grand Gulf being thus taken in the rear, was abandoned on 3rd May, and a few days after Grant was joined by Sherman's corps, which had remained above Vicksburg. An advance was then made up the left bank of the Big Black River, encountering some opposition at Raymond (12th May) and Jackson (14th May). On the 16th a battle was fought at Champion Hills, between Jackson and Vicksburg, by Grant's forces against General Pemberton, who had marched out of Vicksburg with the design of taking Grant in the rear. Pemberton was driven back with loss, and retreated to the Big Black River, across which he was driven the following day. The Federal forces then advanced upon Vicksburg, and on the 19th the investment was complete. Porter immediately obtained control of the Yazoo River. On the 19th and 22nd unsuccessful assaults were made, in the latter of which the loss was nearly 3000. On the 3rd July, the last day of the battle of Gettysburg, General Pemberton, reduced by famine, surrendered with 27,000 men, and on the 4th Grant occupied the city. The result of this campaign rent the Confederacy in twain, and was the severest blow it had yet received. On 16th July General Sherman drove out of Jackson General Joseph E. Johnston, who during the siege had been operating in the rear of Grant.

After abandoning Murfreesborough, Bragg had concentrated the greater part of his forces at Shelbyville and Tullahoma, where they were strongly intrenched. Rosecranz moved quietly at Murfreesborough till 23rd June, 1863, when he advanced and took possession of Shelbyville on the 27th, and of Tullahoma on the 30th, forcing Bragg to retreat to Chattanooga. The Federal advance reached the Tennessee River on 21st August, and by 8th September the army was all across the stream, concentrating at Trenton, some miles south of Chattanooga, which was occupied by a detachment the next day. Bragg retiring into Georgia, and

posting his troops in the vicinity of Chickamauga Creek, east of Trenton. Here, 19th and 20th September, occurred a severe engagement, in which the Federals were worsted, and fell back to Chattanooga, where they were besieged by Bragg. On 23rd October General Grant arrived and took command. Reinforcements under Hooker had previously arrived from the east, and others from the west under Sherman came subsequently. A series of movements was at once initiated, which after much hard fighting resulted in driving Bragg from Chattanooga (25th November), and forcing him to retreat into Georgia. General Burnside, after being relieved from command on the Rappahannock, had been assigned to the command of the department of the Ohio, and having organized a force of about 20,000 men at Camp Nelson, near Richmond, Kentucky, began on 16th August an advance on Knoxville, which was occupied on 1st September. East Tennessee, where the army was enthusiastically received by the population, was thus restored to the control of the Union with little opposition, the greater part of the Confederate forces having been withdrawn to aid Bragg at Chickamauga.

On 10th July a force was landed by General Gillmore, then in command in South Carolina, on Morris Island, at the entrance of Charleston harbour, and on the following day an ineffectual attack was made on Fort Wagner, a strong earthwork at its north end. On the 18th an assault was made in force, which was repulsed with a loss of 1500 men. The fort was then besieged by regular approaches, and was abandoned on 7th September. It was afterwards, with other batteries on the island, turned against Charleston, which was nearly destroyed by the bombardment.

Early in March, 1864, General Grant was appointed lieutenant-general and invested with the chief command of the Union armies, General Halleck being relieved and assigned to duty in Washington as chief of staff to the army. General Grant announced that his headquarters would be with the army of the Potomac in the field. On 4th May he began to cross the Rapidan and advance into the Wilderness, a region on the south bank of that stream in Orange and Spottsylvania counties. Here (5th and 6th May) and at Spottsylvania Court House near by (8th to 21st May), followed a series of sanguinary engagements. Grant then advanced by a series of flank movements to the Chickahominy, where on 3rd June occurred the second battle of Cold Harbour, in which the Federal assault on the Confederate position was repulsed with great loss. On the 12th, having determined to attack Richmond from the south, he began to move, crossing the Chickahominy below Lee's position, and effecting the passage of the James, 14th and 15th June. Lee thereupon retired within the intrenchments covering Richmond. On the 15th and 16th a part of the Union forces unsuccessfully assailed Petersburg, and on the 19th Grant began a regular siege. On 30th July, a mine having been exploded, another attack was made, which was repulsed with loss. The siege of Petersburg and Richmond continued till 3rd April, 1865, when, after Lee's defeat at Five Forks (31st March, 1st April), those places were occupied by the Federals, having been evacuated by Lee during the preceding night. Grant vigorously pursued the retreating army, and at Appomattox Court House on the 9th compelled Lee to surrender the remnant of his forces, about 27,000 in all, an event which virtually terminated the war.

On 7th August General Sheridan had been placed in command of the Federal forces to operate in the Shenandoah Valley. His force was soon raised to 30,000, Early opposing him with about 20,000. He defeated Early on Opequan Creek, near Winchester (19th September), at Fisher's Hill, 8 miles south (22nd September), and on Cedar Creek near by (19th October), virtually clearing the valley of Confederate troops. In the battle of Opequan Creek he lost 3000 men, and captured the same number of prisoners

and five guns; in that of Fisher's Mill he took 1100 prisoners and sixteen guns. In the battle of Cedar Creek Early surprised the Union camp at dawn in the absence of General Sheridan, driving back the troops in confusion and capturing the camp and defences, twenty-four guns, and 1200 prisoners. Sheridan, then at Winchester, being aroused by the firing, hurried to the front, and having reorganized his troops, retook the camp and guns in the afternoon, recovering many of the prisoners taken in the morning, and taking from the enemy 1500 prisoners, twenty-three guns, and 1500 small arms, besides equipments.

When General Grant assumed the chief command, General W. T. Sherman was placed in command of the division of the Mississippi, comprising the departments of the Ohio, the Cumberland, the Tennessee, and the Arkansas, and was to move against Atlanta, Georgia, simultaneously with Grant's advance on Richmond. His forces for the campaign were encamped around Chattanooga, and consisted of a little less than 100,000 men, with about 250 guns, comprising the army of the Cumberland, General Thomas; the army of the Tennessee, General Macpherson; and the army of the Ohio, General Schofield. He was opposed by General J. E. Johnston, with about 50,000 men, encamped at Dalton, organized in three corps under Hardee, Hood, and Polk. Sherman started on 5th May, and gradually forced Johnston back, compelling him after much severe fighting to cross the Chattahoochee on 10th July and seek the intrenchments covering Atlanta. Here he was superseded by Hood, who made several attacks on Sherman, which were repulsed with great loss, and was compelled to abandon Atlanta on 1st September. Having removed the inhabitants from the city and burned everything except the dwellings and churches, General Sherman started near the middle of November for the coast, with about 60,000 men. Marching through the heart of Georgia without opposition, he reached the vicinity of Savannah. On 13th December Fort McAllister, on the Ogeechee River, in the rear of Savannah, was carried by assault by General Hazen, and communication was then opened with the fleet. On the 21st Savannah was occupied, having been abandoned by its garrison during the preceding night. On 1st February General Sherman started from Savannah on a northward movement through the Carolinas, and reached Columbia on the 17th. General Hardee, being thus taken in the rear, evacuated Charleston, which was occupied by a detachment of General Gillmore's forces on the 18th, and the same day the United States flag was raised over Fort Sumter. Sherman, continuing his march, reached Fayetteville, North Carolina, on 12th March. On the 19th the left wing under Slocum encountered the Confederate army under General Johnston at Bentonville, repelled several assaults, and on the 21st, being reinforced, compelled it to retreat to Smithfield, covering Raleigh. Sherman then occupied Goldsborough, whence he advanced on 10th April. Johnston retreated to and through Raleigh, and on 26th April surrendered his entire army, then reduced to about 31,000 men. In the meantime a cavalry force under General Wilson had swept through Alabama from the north, and passed into Georgia, doing immense injury to the Confederate resources. The last fight of the war occurred on 13th May, on the Rio Grande in Texas, between Colonel Barrett (Federal) and General Slaughter (Confederate), the latter being victorious. The trans-Mississippi army of the Confederates, the last in the field, was surrendered by Kirby Smith on 26th May.

Measures were immediately taken to disband the Federal armies, and in a few months the greater part of the soldiers had returned to civil life. The strength of the national armies at different periods was as follows:—1st July, 1861, 186,751; 1st January, 1862, 575,917; 1st January, 1863, 918,191; 1st January, 1864, 860,707; 1st

January, 1865, 959,460; 1st May, 1865, 1,000,516. At the last date the number of men enrolled as subject to military duty, but not called out, was 2,254,063. The number of men who received the United States bounty (100 dollars to 400 dollars each) was 1,722,690; amount paid, 300,223,500 dollars. The amount of bounties paid by states and local authorities, so far as returned, was 285,941,036 dollars.

The war was relatively the most sanguinary on record. According to the statistics, 257,825 Union soldiers lie buried in the various national cemeteries. Including losses of which no account can be taken, the war cost the North 320,000 lives, or more than one in nine of all those who entered the service. The two opposing armies met in over 2000 skirmishes and battles. In 148 of these conflicts the loss on the Federal side was upwards of 500 men, and in at least ten battles more than 10,000 men were reported lost on each side. The combined losses of the Federal and Confederate forces in killed, wounded, and missing in the following engagements were:—Shiloh, 24,000; Antietam, 38,000; Stone River, 37,000; Chancellorsville, 28,000; Gettysburg, 54,000; Chickamauga, 33,000; McClellan's peninsula campaign, 50,000; Grant's peninsula campaign, 180,000; and Sherman's campaign, 125,000. Waterloo was one of the most desperate and bloody fields chronicled in European history, yet Wellington's casualties were less than 12 per cent., while during the American War the loss at Murfreesborough, Atlanta, Chickamauga, Gettysburg, and other places, frequently reached and sometimes exceeded 40 per cent., and the average of killed and wounded on one side or the other was 30 per cent. If the figures of the Confederate losses could be accurately ascertained, the total deaths in the war would probably surpass 500,000. It is not a little curious that the losses and captured men of the Federals—who were victorious in the struggle—almost equalled the whole of the Confederate forces.

During the war Confederate cruisers scoured the ocean. Evading vessels of war they destroyed hundreds of merchantmen, doing irreparable injury to the commerce of the Union. The chief of these were the *Alabama*, *Chickamauga*, *Florida*, *Georgia*, *Olinde*, *Shenandoah*, *Sumter*, and *Tallahassee*. The *Alabama*, the most famous, commanded by Raphael Semmes, was sunk off Cherbourg, France, 19th June, 1864, by the United States steamer *Kearsage*, commanded by Captain Winslow. See ALABAMA, THE.

A presidential proclamation of 23rd June, 1865, removed the blockade of all the ports in the Southern States, and another of 29th August annulled all restrictions upon trade with them. On 2nd April, 1866, the insurrection was proclaimed at an end in all the states except Texas, and there on 29th August. After the fall of Richmond President Davis of the Confederacy fled south, and was captured at Irwinville, Georgia, by General Wilson's forces, 10th May, 1865. He and some other prominent leaders were imprisoned for a time, but no man was punished for participation in the rebellion. On 29th May, 1865, the president issued an amnesty proclamation, excepting fourteen classes of those most prominent in the rebellion. This was followed by others on 7th September, 1867, 4th July, 1868, and 25th December, 1868, the last making the amnesty universal.

The question of emancipation early attracted the attention of the president and Congress. On 16th April, 1862, an Act was passed abolishing slavery in the district of Columbia, and on 9th June another Act declared that slavery should not thereafter exist in the territories. The act of 17th July declared that all slaves of persons who should thereafter be engaged in rebellion, escaping and taking refuge within the lines of the army, all slaves of such persons captured or deserted, and coming under the control of the United States, and all slaves of such persons

found in any place occupied by rebel forces and afterwards occupied by the Federal forces, should be free. The same Act authorized the president to receive into the military and naval service persons of African descent. On 1st January, 1863, the president issued a proclamation, in pursuance of a warning contained in one of the 22nd September, 1862, declaring free all persons held as slaves within the states or portions of states then in rebellion. On 8th April, 1864, a joint resolution amending the Federal constitution, by declaring that slavery shall not exist within the United States or any place subject to their control, passed the Senate by a vote of 38 to 6, and on 31st January, 1865, it was approved by the House of Representatives by a vote of 119 to 56. This, known as the Thirteenth Amendment, the secretary of state on 18th December, 1865, proclaimed ratified by the legislatures of three-fourths of the States, and consequently valid to all intents and purposes as a part of the constitution. On 9th April, 1866, the Civil Rights Bill was passed by Congress over the president's veto; it enacted "that all persons born in the United States and not subject to any foreign power, excluding Indians not taxed, are hereby declared to be citizens of the United States; and such citizens of every race and colour, without regard to any previous condition of slavery or involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall have the same right in every state and territory in the United States to make and enforce contracts; to sue, be parties, and give evidence; to inherit, purchase, lease, sell, hold, and convey real estate and personal property; and to full and equal benefit of all laws and proceedings for the security of person and property, as is enjoyed by white citizens, and shall be subject to like punishment, pains, and penalties, and to none other; any law, statute, ordinance, regulation, or custom to the contrary notwithstanding."

The exultation of the Northern States at the conclusion of the war was suddenly overclouded by the assassination of their honest and devoted leader. President Lincoln, who had been re-elected in November, 1864. While seated in his box at Ford's Theatre, Washington, he was shot by a fanatic, named Wilkes Booth; and about the same time Mr. Seward, the foreign secretary, and his son, were wounded in their own house by an assassin. Both the latter eventually recovered, but Lincoln died at 7.30 on the morning of the 15th April. The vice-president, Andrew Johnson, was then sworn in as president. In 1868 an attempt was made to impeach him for alleged unconstitutional acts, but it failed. During the remainder of his term of office, however, Mr. Johnson was powerless for good or evil, as every republican measure was passed over his veto by a majority of two-thirds in both houses.

General Grant was elected president in 1869, and re-elected in 1873. One of the most prominent events of his administration was the settlement of outstanding disputes with Great Britain, of which the principal related to the charge that the British government had failed in its duties as a neutral in allowing the construction and fitting out of Confederate cruisers in British ports. The claims for damages on this account were known as the "Alabama claims." After protracted correspondence it was agreed to appoint a joint high commission to negotiate a treaty. The commissioners on the part of the United States were Hamilton Fish, secretary of state; Samuel Nelson, associate justice of the Supreme Court; Robert C. Schenck, then minister to England; E. R. Hoar, attorney general; and George H. Williams, then United States senator. Those on the part of Great Britain were Earl de Grey (now Marquis of Ripon), Baron Grantham, Sir Stafford Henry Northcote (afterwards Lord Iddesleigh), Sir Edward Thornton, Sir John Alexander Macdonald, and Montague Bernard. The commissioners assembled in Washington 27th Febru-

ary, 1871, and on 8th May signed the treaty of Washington, the ratifications of which were exchanged at London on 17th June. The treaty provided for the settlement of the Alabama claims by a tribunal of arbitration to meet at Geneva, Switzerland, and to be composed of five arbitrators, appointed one each by the president, the queen, the King of Italy, the President of the Swiss Confederation, and the Emperor of Brazil. Other claims of American citizens against the British government and of British subjects against the United States, arising out of acts committed between 13th April, 1861, and 9th April, 1865, were to be referred to three commissioners, appointed, one by the president, one by the queen, and one by the two jointly, to meet in Washington. The conflicting claims of the two nations, growing out of the treaty of 15th June, 1846, to San Juan and other islands between Washington territory and Vancouver Island, were referred to the arbitration of the Emperor of Germany. The treaty also contained certain stipulations respecting the navigation of rivers, lakes, and canals adjacent to the United States and Canada, and respecting the transit of goods through those countries, and provisions respecting the coast fisheries. The Geneva tribunal was composed of the following arbitrators:—Charles Francis Adams, appointed by the United States; Sir Alexander J. E. Cockburn, by Great Britain; Count Paolo Federico Sclapin de Salernano, by Italy; Jakob Staempli, by Switzerland; and Marcos Antonio d'Arango, baron (afterwards viscount) d'Iajubi, by Brazil. The settlement of the questions in dispute was for some time menaced by the introduction of vast indirect claims by the United States, which the English government declined to admit, and refused to take part in the arbitration until they were withdrawn. On an intimation from the arbitrators, who met at Geneva in June, 1872, that no claim of the kind could in any way be supported, the American government withdrew its demand, and the arbitration proceeded. On the 11th September damages were awarded by a majority of the arbitrators to the amount of about £3,100,000, for the depredations committed by four of the ten or twelve cruisers of which complaint had been made. The sum awarded was paid in September, 1873, at Washington, and the question, which had seriously imperilled the friendly relations of the two countries, was thus finally disposed of. In 1872 the San Juan dispute had also been decided against England by the Emperor of Germany, and the Haro Channel now forms the boundary between the American mainland and the coast of Vancouver Island.

General Garfield was elected president in 1880, and assumed office on 4th March, 1881, under most favourable auspices. On 2nd July, as he was about to leave Washington for New York by train, he was shot at by a Chicago lawyer and disappointed place-hunter, named Charles Guiteau. The indignation at this act was not confined to the United States, but messages of sympathy with his family were forwarded by the rulers of every civilized country. For two months the president hovered between life and death, but expired somewhat suddenly on 19th September, and the result of a *post-mortem* examination was to show that the wound had really been mortal, and the case had been desperate from the first. Immediately the tidings of his death reached England the queen telegraphed to Mrs. Garfield—"Words cannot express the deep sympathy I feel with you at this terrible moment. May God support and comfort you, as He alone can." As a mark of respect, which had the greater significance, as it was the first of the kind paid by an English sovereign to the president of a republic, the court went into mourning for a week, and at the funeral a wreath, sent by the queen, with the following inscription, was placed on the coffin:—"Queen Victoria to the memory of the late President Garfield; an expression of her sorrow and sympathy with Mrs. Garfield and the American nation."

Mr. Arthur, vice-president, succeeded to the presidency, and his term of office was not marked by any events of importance. The presidential election in 1884, which was the keenest on record, resulted in the election of Mr. Cleveland, and the defeat of the Republican party, which had held office for twenty-four years.

In his first message to Congress, in 1885, President Cleveland recommended the appointment of a commission to consider the whole question of the British and American fisheries, which had been a matter of contention between the two countries for many years. The treaty of Peace of 1783 gave American fishermen much the same power to fish in the territorial waters of British North America as they had enjoyed before the separation from the mother country. This was coupled with certain restrictions and conditions, the exact nature of which became a subject of warm dispute between the two countries when they were negotiating the treaty that followed the war of 1812. It was impossible to come to an understanding, and all mention of the fisheries was therefore omitted from the second treaty. American fishing vessels were excluded from Canadian waters, and trespassers were seized. Then came the Convention of 1818, granting American fishermen most of the powers and privileges they had temporarily lost, on condition that they should neither take, cure, nor dry fish "on or within 3 marine miles of any of the coasts, bays, creeks, or harbours" of British North America. This apparently was sufficiently explicit, but disputes continued. The question was raised as to what is a bay? And it became necessary to define the precise signification of the "three marine miles." England contended that a bay meant any bay, great or small, and that the three-mile line should be drawn from headland to headland. The United States said that it must follow the sinuosities of the coast, in all cases at least where the mouths of bays were more than 6 miles wide. The difference was all-important, for the British construction, when applied to the larger bays, shut out the Americans from some of the richest fishing grounds in the world. England from time to time yielded a point, but only for peace and quietness, and not as a surrender of principle. The American fishermen fished within the larger bays, and sometimes their boats were seized, and at others they were not. Matters were at length put on a more satisfactory footing by the conclusion of a reciprocity treaty between Canada and the United States. The Americans were to enjoy the use of the Canadian and Newfoundland inshore fishings; the Canadians were to have certain privileges of free trade with the United States. This lasted from 1854 to 1865, when the Washington government terminated the treaty on the ground that the advantages arising from it were all on the side of Canada. American fishermen still plied their calling as before, but they agreed to pay a compensation, and, in 1877, Canada and Newfoundland were awarded £1,000,000 sterling by the Mixed Commission, constituted under the treaty of Washington. But New England did not like this arrangement. The importation of fish and fish oils was supposed to be detrimental to her local interests, and she induced the government of Washington to terminate the fisheries clauses of the treaty. The United States had already refused to negotiate a new reciprocity treaty with Canada, and thus the controversy remained almost where it was at the outset. The dispute became a "burning question" in 1886, in consequence of the seizure of certain American vessels, and in the hope of arriving at a satisfactory solution of the dispute, a joint commission was appointed by the United States and the United Kingdom in 1887—the Right Hon. J. Chamberlain, M.P., being the chief commissioner for Great Britain.

**Literature.**—The literary history of the United States may be treated under three distinctly marked periods—viz. a colonial or ante-revolutionary period (1620-1775), during

which the literature of the country was closely assimilated in form and character to that of England; a first American period (1775-1820), which witnessed the transition from a style for the most part imitative to one in some degree national; and a second American period (from 1820 to the present time), in which the literature of the country has assumed a decided character of originality.

1. 1620-1775. The first literary production of any note in the British American colonies was the version of Ovid's "Metamorphoses" made by George Sandys in Virginia about 1620 (London, 1626). But though men of letters were found everywhere among the early colonists, in New England alone, where in 1639 the first printing press was established in Cambridge, was any considerable progress in literary culture made, and the literature of the first or colonial period was chiefly confined to that locality or was indirectly connected with it. The earliest development was theological. The "Bay Psalm Book" (Cambridge, 1640), the first book printed in the country, though not strictly original, became very popular both in America and Great Britain, and within a little more than a century passed through seventy editions. Ten years later a volume of poems by Mrs. Anne Bradstreet of Massachusetts (1612-72), entitled "The Tenth Muse lately sprung up in America," was published in London, and reprinted in Boston with additions in 1678. The most remarkable early productions of the colonial press were the Indian Bible of John Eliot (1604-90), the first edition of the Scriptures published in America (Cambridge, 1661-63), and an extraordinary monument of patience and industry, though now of interest only to the antiquary; the "Concordance of the Scriptures," by John Newman, which was the earliest work of its kind, and the immediate precursor of Cruden's Concordance; and the prolific writings of Increase and Cotton Mather, the latter of whom (1663-1728) was the author of 382 works, "many of them in their day, but of most of which not even the titles are remembered. The establishment of Harvard College in 1636, and of William and Mary and Yale Colleges in the last decade of the seventeenth century, and the practice, which became common with many of the wealthier colonists, of sending their sons to England to be educated, showed their effects in the gradual improvement of style and in the more discursive aims of writers. But theology was still the department of letters most generally cultivated, and among a fairly numerous body of American theologians Jonathan Edwards (1703-58), whose power of subtle argument Sir James Mackintosh declares to be "perhaps unmatched, certainly unsurpassed among men," was the first not only in America, but, according to Robert Hall, in "any country or age." His celebrated treatise on the "Freedom of the Will" ranks among the standard authorities in English metaphysics; and his other works exhibit a force of thought and keenness of argument only displayed by the greatest minds. John Woolman (1720-72), a Quaker writer and preacher, deserves mention as one of the first who wrote against slavery. The influence of the great English essayists and novelists of the eighteenth century had meanwhile begun to affect the literature of the new world; and in the essays, the collection of maxims published under the title of "Poor Richard," the scientific papers, and the autobiography of Benjamin Franklin (1706-90), we have specimens of practical philosophy or of simple narrative, expressed in a style eminently clear, pleasing, and condensed, and not unfrequently embellished by the wit and elegance characteristic of the best writers of Queen Anne's time. The historians and annalists are less prominent than the theologians; but the tracts and pamphlets relating to the discovery and colonization of British America, written by early settlers, are exceedingly numerous, and the journals and annals of Winthrop, Winslow, Morton, and others are worthy of note as being

the sources from which modern historical writers have derived much important information. Among the more important earlier contributions to American local history are that of the discovery and settlement of Virginia by William Smith (died 1750), and that of Massachusetts by Thomas Hutchinson, its last colonial governor, a man of considerable learning and culture. Of works relating to the Indians, the most noteworthy was the history of King Philip's war by the famous Captain Benjamin Church (1639-1718).

2. 1775-1820. The earliest works produced during the first American period, beginning with the revolution, are naturally associated with the causes which led to that event; political pamphlets, speeches, letters, and other writings of the men who aided in securing the independence of the North American colonies abound, and richly repay study even at this day. The high literary ability and practical wisdom evinced in the public documents of the principal American statesmen were recognized by Lord Chatham, who praised them as rivaling the masterpieces of antiquity. Politics now gained a prominence almost equal to that enjoyed by theology in the preceding period. For fervid declamation Patrick Henry (1736-99) stands at the head of all the orators of this period; and in the reports of his speeches, meagre as they are, he has been more fortunate than others of his contemporaries. The "Common Sense" of Thomas Paine (1737-1809), though not strictly the work of an American author, may be classed with the early national literature, from the fact that it was thoroughly American in tone, and was inspired by the causes which produced the revolution. The great state paper of this era was the "Declaration of Independence," by Thomas Jefferson, which may be considered unrivalled among works of its class. The writings of George Washington (1732-99) must always hold a distinguished place in American literature, not only for their lofty patriotism and solid common sense, but for their clearness of expression and force of language; a characteristic, indeed, of most of the writers who were contemporary with him. John Adams, who wrote with perspicuity and elegance, published a "Defence of the American Constitution," and left numerous political papers and letters, which, together with his "Diary," begun in 1755, have been edited by his grand-son Charles Francis Adams. The historians and biographers of this period creditably illustrate the growing literature of the country, and several of their productions are still regarded as standard authorities. The most important contribution to natural history was the "Description of the Birds of North America," by Alexander Wilson (1766-1813). To these names may be added those of Lindley Murray (1745-1826), author of the well-known "English Grammar" bearing his name, and the eminent physicist Benjamin Thompson, Count Rumford (1753-1811), both of whom were Americans by birth and education.

3. From 1820. The last period in American literature presents a marked contrast to those which preceded it, in the national character as well as in the variety and extent of its productions. It was in 1820 that the poverty of American literature was suerily commented upon by Sydney Smith in an article in the *Edinburgh Review*; and from that date the intellectual development of the country, the political crisis which attended the establishment of the government being past, has been commensurate with its social and material progress, until at the present day there is no department of human knowledge which has not been explored by American authors. In history, in jurisprudence, and in certain departments of natural science and imaginative literature, many of their productions during the last fifty years deserve to be ranked among the best in the universal literature of the age. Prominent among these is George Bancroft (born 1800), whose excellent

"History of the United States" brings the history down to the close of the revolution. Among the most successful of the writers of American history is Francis Parkman (born 1823), who has devoted himself to narrating the rise and fall of the French dominion in America. The Civil War of 1861-65 has given rise to a large class of works, most of them necessarily ephemeral, but some of which deserve special mention as histories or sources of history. Prominent among these are "The Rebellion Records" (1861-71), edited by Frank Moore, a vast collection of documents in twelve volumes; "History of the American Civil War," by J. W. Draper; "Report of the Army of the Potomac," by General George B. McClellan; and "Memoirs of General William T. Sherman," by himself. All of these represent the Union side of the conflict, while on the Confederate side the following are the principal works: "The War between the States," by A. H. Stephens; "Personal Reminiscences" of Lee, by J. W. Jones; lives of Lee and of Stonewall Jackson, by J. Estlin Cooke, &c. The list of histories of single states or groups of states, of special territorial districts, or of institutions, presents many works of merit. At the head of these perhaps stands the "History of New England," by J. G. Palfrey (born 1796). The history of the aboriginal tribes has been ably treated by S. G. Drake, whose "History and Biography of the Indians of North America" was the first attempt at an impartial narrative of the subject, and is a valuable repository of facts; by T. L. McKenney and James Hall, who published a costly illustrated "History of the Indian Tribes of North America;" by George Catlin, and especially by Henry Rowe Schoolcraft (1793-1864), whose elaborate "Historical and Statistical Information respecting the History, Condition, and Prospects of the Indian Tribes of the United States," the most considerable work of the class, is in six vols. 4to. Among American authors whose labours have been prosecuted beyond the limits of local or domestic history, no name stands higher than that of William Hickling Prescott (1796-1859), the historian of the Spanish conquest and civilization in the New World, and one of the most graceful writers of the English language. His histories of the reigns of Ferdinand and Isabella and Philip II. of Spain, and of the "Conquest of Mexico" and the "Conquest of Peru," and his sequel to Robertson's "History of Charles V.," exhibit remarkable depth and accuracy of research, combined with impartiality and soundness of judgment. The style is at the same time so lucid and attractive as frequently to invest the narrative with the charm of fiction. As Prescott was the first to treat adequately the brilliant period of Spanish ascendancy, so the revolt of the Spanish provinces of the Netherlands and their history as a free Protestant commonwealth have afforded a congenial subject to John Lothrop Motley (born 1811), whose "Rise of the Dutch Republic," "History of the United Netherlands" (a continuation of the former), and "Life and Death of John of Barneveld" display extensive research, and are written with animation, and occasionally with great picturesque beauty. His works have taken their place among the great histories of the time, and have been translated into the principal languages of Europe. To the department of literary history, the most important contributions are the "History of Spanish Literature," by George Ticknor, esteemed the best work on the subject extant; and the several works of R. W. Griswold on the "Prose Writers," the "Poets," and the "Female Poets" of America. The "Cyclopædia of American Literature," by E. A. and G. L. Duyckinck, is the only comprehensive work on the subject yet published; and the "Critical Dictionary of English Literature," by S. Austin Allibone, forms a valuable epitome of the literary history of England and the United States. Among miscellaneous works which have earned world-wide reputation are the "History of Civilization," in



seven volumes, by Amos Dean, and the "History of the Intellectual Development of Europe," by J. W. Draper.

The first in point of date and reputation among the writers of biography of this period is Washington Irving (1783-1859), whose narratives of the "Life and Voyages of Christopher Columbus" and of the "Voyages and Discoveries of the Companions of Columbus," though not the most characteristic of his writings, constitute a permanent contribution to English and American literature. His "Life of George Washington," completed a few months before the author's death, has been more generally read in America than any other of his works.

Washington Irving was the first American whose fame in the department of prose fiction extended beyond the limits of his native country, and his "Sketch Book," "Knickerbocker's History of New York," "Bracebridge Hall," and "Tales of a Traveller," first introduced to a European public between 1820 and 1830, attracted immediate attention by their imaginative power, by their fine pathos and humour, and by the singularly pure and graceful style in which they were expressed. James Fenimore Cooper (1789-1851) has the credit of giving the first decided impulse to romantic fiction in the New World, and through his works American literature became first generally known abroad. His "Spy," his nautical tales, including "The Pilot" and "The Red Rover," and above all his series of Indian stories, abounding in lively pictures of forest life, took a strong hold upon the popular mind in both hemispheres. He was deficient in some of the requisites of a novelist, but his faculty of description and quick appreciation of what was tangible and characteristic in his native land enabled him to gain a universal distinction almost unsurpassed in his field. The success of Cooper gave to the novel of adventure and backwoods life, or that founded upon colonial and revolutionary incidents, a popularity which caused it for a long time to be the chief form of fiction cultivated in America. For finish of style, delicacy of psychological insight, and power in delineating the darker features of life and the emotions of guilt and pain, Nathaniel Hawthorne (1801-64) holds a peculiar place among American novelists. Writing on national subjects, and delighting especially in the gloomy passages of New England colonial history, he employed fiction less for the purpose of illustrating practical life, or of adding to the creations of the imaginative world, than of solving psychological problems. His "Scarlet Letter" and "House of the Seven Gables" were preceded by a variety of fancy sketches and historical narratives, published under the titles of "Twice-told Tales" and "Mosses from an Old Manse," which in point of style and subtle analysis of character are among the most exquisite productions of American literature. The "Blithedale Romance," the next in the order of his novels, is marked by similar characteristics; and the "Mable Farn," the most elaborate of his works, contains pictures of Italian life and scenery of unsurpassed beauty. The "Tales of the Grotesque and Arabesque," and other fictions, by Edgar Allan Poe (1809-49), exhibit extraordinary metaphysical acuteness and a wild and gloomy imagination. As pictures of domestic life among the ancients, the "Zenobia," "Probus," and "Julian" of William Ware (1797-1852) are not surpassed by any similar productions in English literature. One of the most popular novels of the present century was the "Uncle Tom's Cabin" of Mrs. Harriet Beecher Stowe, an anti-slavery fiction, which has circulated by millions of copies in many languages, and deeply moved the public heart in Europe and America, not more on account of the moral of the story than of its pathos, its humour, and its inimitable pictures of negro life. The surpassing finish of the novels of Henry James, "The American," "The Europeans," "Daisy Miller," "Princess Casanoviana," &c., have raised him to the first rank of living writers of fiction, though,

like Hawthorne, he has a tendency to unduly neglect plot for the sake of a study of psychology. W. D. Howells (born 1837), whose "Suburban Sketches," "Their Wedding Journey," "A Chance Acquaintance," "A Foregone Conclusion," "Private Theatricals," "The Undiscovered Country," "The Lady of the Armistock," "Indian Summer," &c., are distinguished by a charming style and a subtle and pleasant humour; and Julian Hawthorne, a son of Nathaniel (born 1846), who has attracted attention by novels of great promise, "Bresant," "Idolatry," "Garth," &c., which in style and tone exhibit many of his father's characteristic qualities—are two writers whose audience, like that of Henry James, extends to all English-speaking peoples. G. W. Cable has produced some exquisite sketches of the Southern States in "Old Creole Days," &c.

The earlier humorous writers of the period are represented by Seba Smith (1792-1868), author of the well-known letters of "Major Jack Downing;" Irving, whose "Knickerbocker's History of New York" is perhaps the most elaborate piece of humour in the national literature; and Paulding, who in conjunction with Irving produced the "Salmagundi," &c. Oliver Wendell Holmes has a copious vein of original humour, which appears to the best advantage in his poems and miscellaneous prose writings. No list of American humorous writings would be complete without an allusion to that class of grotesque tales of which the "Big Bear of Arkansas" and the "Quarter Race in Kentucky," by T. B. Thorpe, afford characteristic specimens. Among later humorists are Bret Harte, S. L. Clemens ("Mark Twain"), C. F. Browne ("Artemus Ward"), (1834-67), D. R. Locke ("Petroleum V. Nasby"), R. H. Newell ("Orpheus C. Kerr"), and Charles G. Leland ("Hans Breitmann").

The female writers of fiction of this period constitute a numerous and important body, and the works of some of them are not exceeded in popularity by any contemporary writings of their class. It will suffice to mention, "The Wide, Wide World" and "Queechy," by Miss Susan Warner; "Fern Leaves," and other popular productions, by Mrs. S. P. W. Parton ("Fanny Fern"); the books of Miss E. S. Phelps ("The Gates Ajar," and "The Gates between"); Miss Alice Cary, Miss Louisa M. Alcott ("Little Men," "Little Women," &c.), and many others. In intimate connection with the departments already treated is the very large one of American juvenile literature. S. G. Goodrich's numerous little books for children, published under the pseudonym of "Peter Parley," have had a prodigious circulation in Europe as well as America. Nathaniel Hawthorne wrote some delightful tales for children; Jacob Abbott (born 1803) is the author of the popular "Rollo," "Lucy," "Franconia," and other series of stories, and of numerous juvenile histories; and many others have devoted a large portion of their time to this species of literature.

The poetry of this period has shown a remarkably healthy and abundant development. Among those who have made a felicitous use of native materials, one of the most eminent and thoroughly American is William Cullen Bryant (born 1794), whose poems, the fruits of meditation rather than of passion or imagination, are remarkable for their descriptive powers, their serene and elevated philosophy, and their noble simplicity of language. The few brief poems of Ralph Waldo Emerson (1803-82), of which "The Problem" and the lines "To a Humble Bee" afford examples, are remarkable for their quaintness and originality. Among early writers of the period who are remembered for one or more successful poems are F. S. Key (1779-1843), author of the "Star-spangled Banner," and John Howard Payne (1792-1852), whose "Home, Sweet Home" is known wherever the English language is spoken. Among later song-writers is Stephen C. Foster (1826-64), who wrote the best "negro" melodies, "Old Folks at Home," "Old Dog Tray," &c. The poems of E. A. Poe form a fitting

accompaniment to his prose writings, and are characterized by a shadowy and gloomy imagination and a fascinating melody of rhythm. "The Raven" illustrates his facility in harmonizing sentiment with rhythmical expression, and his "Annabel Lee," "Haunted Palace," and "Bells" are constructed with equal skill. The most artistic and cosmopolitan of American poets, and the most widely read abroad, is H. W. Longfellow (1807-82), whose genius has been powerfully influenced by the literature and historic associations of the Old World, while in the choice and treatment of his principal subjects he is eminently American. Much of the poetry of J. G. Whittier (born 1807) was prompted by his opposition to slavery, and in occasional pieces he rises to a strain of genuine lyrical exultation. Of this character are his "Massachusetts to Virginia" and "Astræa at the Capitol." In other poems he unites tenderness and grace with much simplicity of language. All of his descriptive poems, but especially "Snow-bound," his masterpiece, are strikingly national. James Russell Lowell (born 1819) is one of the most versatile poets of this period, and has won high reputation as a prose writer by several volumes of essays, chiefly on literary topics. His serious poems are earnest and philanthropic in tone, elevated in sentiment, and of high artistic merit. He is perhaps the ablest of American satirists, and has gained a unique reputation as a humorist by his "Biglow Papers," in which the peculiar phraseology of New England is given with great verbal and idiomatic correctness. The prose introductions to these poems have a subtle humour which can be best appreciated by those familiar with the local peculiarities they illustrate. Not less conspicuous as a humorist is O. W. Holmes (born 1809), the most effective writer of the school of Pope, and distinguished by a clear, concise, and manly style. For the mingled pungency and geniality of his humour he is unrivalled among American poets. In his knowledge of local dialects and idioms he is not inferior to Lowell. Walt Whitman's (born 1819) curious unrhymed and rhapsodical poems, full of most powerful thought, severely criticised as they are at home, have found warm admirers in England.

First of American essayists is the widely-known R. W. Emerson, an original and independent thinker. He has written in an abstract manner upon social, moral, and political questions, and his style is of finished beauty and significance. Of the school of Emerson was Margaret Fuller Ossoli (1810-50), author of "Woman in the Nineteenth Century," an earnest protest against the commonly received views of the social position of women, and "Papers on Literature and Art," some of which originally appeared in the *Dial*, a quarterly publication which was for several years the organ of Emerson and his friends. In general acquirements and conversational powers she was probably the most noted woman of her time in America. The original essays ("Walden," &c.) of H. B. Thoreau (1817-62), as acute as they are eccentric, were not so fully appreciated during his life as now. They command much interest for their matter and their delicious style. Anything like a complete enumeration of the writers who have gained distinction in the wide field of belles-lettres or magazine literature would be impossible within the limits of this article; and only those who are generally known or who may stand as representatives of their class can be mentioned. The most distinguished of all is Washington Irving (1783-1859), whose "Crayon Papers," published in England in 1822 under the title of "The Sketch Book," represents perhaps the author's most successful attempts in elegant literature. The "Inklings of Adventure," "Pencilings by the Way," "Letters from under a Bridge," and other piquant sketches of people and manners by N. P. Willis; the series of discursive essays by O. W. Holmes, entitled "The Autocrat of the Breakfast Table," "The Professor at the Breakfast Table," and "The Poet at the

Breakfast Table;" the "Reveries of a Bachelor," by D. G. Mitchell ("Ik Marvel"); the "Potiphar Papers," by G. W. Curtis; "Meister Karl's Sketch Book," by C. G. Leland; and the "Fern Leaves" of Mrs. Parton, are popular examples of what has been accomplished by other authors. The United States have excelled in translations. Perhaps the best translator of Goethe's "Faust" is Bayard Taylor (1825-78), who also wrote books of travel, essays, and poems; one of the best translations of Dante is that by Longfellow, and Bryant's version of Homer has many merits.

For dignity of expression, breadth, and force of thought, and a style strong, simple, and sometimes grand, the forensic arguments and public and political speeches of Webster (1782-1852) may rank with the masterpieces of oratory in any language. The spontaneous, impassioned eloquence of Clay (1777-1852), on the other hand, depended so much for its effect upon the voice and manner of the speaker, that his reputation will be mostly traditional. His published speeches give little indication of the mastery of the feelings for which he was almost unrivalled. Among the anti-slavery orators, to which class Charles Sumner also properly belonged, were William Lloyd Garrison (1801-84), whose popular addresses were singularly effective; Wendell Phillips (born 1811), a vigorous and impulsive speaker, frequently rising to a strain of impassioned eloquence; Theodore Parker (1810-60), Henry Ward Beecher (1813-87), R. W. Emerson, and Frederick Douglass (born 1817).

One movement claims notice in the department of theology. About the commencement of this period a memorable controversy took place in New England between Samuel Worcester, representing the conservative or orthodox Congregationalists, and W. E. Channing (1780-1842) on behalf of the Unitarians, who thenceforth became an independent, and, in proportion to their numbers, an important sect. The writings of Channing had great influence in moulding the opinions now generally held by Unitarians in the United States and Great Britain, and contemporary with him was a body of divines and scholars of considerable literary culture, resident chiefly in Boston and its vicinity, whose education was acquired at Harvard College, where a large proportion of the Unitarian clergy have since graduated. Distinguished from these is a rationalistic school of Unitarianism, chiefly represented by Theodore Parker (1810-60), whose writings evince extensive scholarship and furnish frequent examples of rhetorical beauty and force. His life has been written by many pens. The most admirable biography, however, is that by O. B. Frothingham, author also of an eloquent work entitled "Transcendentalism in New England."

Under the head of philology may be mentioned the two great English dictionaries by Noah Webster (1758-1843) and Joseph E. Worcester (1784-1865), which have superseded all others in popular use in the United States; the "Lectures on the English Language" and other works, by G. P. Marsh; and the "Dictionary of Americanisms," by J. R. Bartlett.

A peculiar and important class of books of travel has resulted from the explorations undertaken at various times by the United States government, with a view of adding to the general stock of geographical knowledge, or of developing the resources of its own territory. The most elaborate of these is the "Narrative of the United States Exploring Expedition around the World," by Captain Charles Wilkes, in five volumes. Another exceedingly interesting work is Lieutenant (now Major) Greely's "Three Years of Arctic Service," published in 1886. The writer succeeded in attaining the highest latitude yet reached. The wide field of natural history has been explored during this period with results highly creditable to the sagacity and industry of American men of science. The most important work in this department is the "Birds of America," by John James Audubon (1780-1851), remarkable for the vivacity of its



descriptive passages and its splendid illustrations. The general tone of scientific works in the United States is very high, their style lucid, and their matter full of interest, and borne out by great industry in observation. Professor Newcomb in astronomy, Professor Walker in political economy, Professor Youmans in botany, Professor Dana in geology, &c., are excellent writers, and enjoy a world-wide reputation.

**UNITS, ELECTRICAL.** the measures or standards of electrical resistance, quantity, current, &c., employed to compare one wire with another. Various *units* of resistance are in use, but the one most generally, in fact now almost exclusively, adopted in this country is that determined by a committee of the British Association, called the B. A. unit, or *ohm* (so named from Ohm, who first investigated the laws of electrical resistance). The value of the ohm unit of resistance is that given by 240 feet of No. 18 pure copper wire, at 60° Fahr.

The unit of electric "head" or pressure, or electro-motive force, is the *volt*, rather less than that given by a Daniell's cell (about 93 per cent.) The unit of electric current is the *ampere*, which is the current produced by one ohm against one volt. The unit of quantity of electricity is the *coulomb*, which is the quantity given by one ampere strength lasting one second. Finally, the unit of power is the *watt*, equal to one volt multiplied by one ampere, which put into mechanical measurement is .001315 of one horse-power.

**UNIVERSAL AND PARTICULAR.** A proposition is *universal* when it makes its assertion or denial about every one of the things spoken of; and *particular* when it makes such an assertion or denial of some as implies that others are not spoken of. Thus "All men are mortal" is universal, and also "No man is perfect." But "Some men are born in England" and "Some animals cannot live in this climate" are particular. These are the strict logical forms, but it often happens that the universal and particular characters are expressed by a great variety of idiomatic terms, and that even forms of expression which, literally speaking, imply universality, are used in a particular sense. Thus, "Men do not willingly abandon life" strictly means that all men are unwilling to quit life. Nevertheless it would be generally understood to speak of most men, or of all except a few. Except when speaking of laws of nature or necessary conditions of the mind, few writers have much occasion for universal propositions, and consequently the forms of speech which belong to *all*, pass into use when the proposition is intended to be predicted only of *most*. This is why Sir William Hamilton, for greater accuracy, so much desired QUANTIFICATION OF THE PREDICATE. See that article.

**UNIVERSAL JOINT.** in machinery, an invention of Dr. Hooke's, designed to enable the end of a shaft or suspended rod to be moved in any direction as freely as if the junction were effected by a ball-and-socket joint, while the shaft still communicates through the joint the force of torsion. Virtually, the universal joint is two hinges set in the same plane, one permitting motion in one direction, and the other in a direct action at right angles thereto; and by the combined motion of both, the end of the rod or shaft may be made to describe a circle or any other figure. Thus connected lengths of shafts may be made to rotate, though not in the same right line. The universal joint is either single or double.

**UNIVERSAL LANGUAGE.** From the middle ages till now scholars have longed from time to time for a universal language, one which should be founded upon a rigorously symmetrical scheme, easily intelligible and closely connected by sound to meaning, so that all nations learning this one common speech might have a ready means for intellectual exchange. Bacon, Descartes, Leibnitz, all worked at this chimera (for it is nothing else), but the

earliest to weave a connected system was Bishop Wilkins, one of the most learned of the founders of the Royal Society, whose "Essay Towards a Real Character and a Philosophical Language" (1688) at least brought the problem into measurable shape. From that time to the attempts of to-day (with "Volapuk" and other concocted tongues—fearfully and wonderfully made) there have never been wanting followers in more than one country along the good bishop's path. The chief aim of the inventors would seem to be the limitation of meanings to sound and position (so that number, colour, size, and other universal qualities may be connoted by the letters and sounds of the very word itself to an enormous extent), the invariability of pronunciation of each and every symbol, the simplification of grammar almost to the point of annihilation, &c. But since all the systems are mutually destructive, none has as yet risen above the rank of an amusing curiosity.

**UNIVERSAL PRIME MERIDIAN.** It was agreed to have one universal prime meridian for the maps of all countries at the Washington International Conference of 1883, and the meridian of Greenwich was selected for this purpose. Before that conference Berlin was the prime meridian (0°) for Germany, Paris for France, &c., to the complete destruction of the usefulness of maps of one country consulted in another, and to the confusion of time (as when a telegram arrived at its destination apparently long before it had been despatched, &c.), as well as other serious evils. See also the article TIME, STANDARD.

**UNIVERSALISM** is the name given to a system of Christian doctrine which has for its chief point the belief in the ultimate destruction of all evil, and the final salvation of all created spirits, both angelic and human. Those who maintain this theory are generally styled Universalists, and this title is also given to the members of a religious community which flourishes in the United States of America. Considerable obscurity rests over the eschatological system of the Christian Church during the first few centuries of its existence, but there seems to have been from the first considerable difference of opinion as to what would be the ultimate destiny of those who died in sin. One theory appears to have been to the effect that the destruction of the wicked, threatened in the Scriptures, would involve their entire nature, and that they would cease to exist; while a more generally received opinion was, that after the resurrection, those who had died in sin would be doomed to an endless existence of sin and misery. There were always, however, certain teachers who accepted neither of these theories, but who maintained the doctrine of universal restitution, and this seems also to have been the view taken by very many among the first believers. The celebrated Christian work known as the "Sibylline Oracles," teaches explicitly the doctrine of the final restitution of the lost, and as the object of this book was to vindicate Christianity to the heathen, it is reasonable to suppose that it must have fairly represented the Christian ideas of its period. Some of the denominations of the Gnostics, including the Basilidians, the Valentinians and others, held to the doctrine of the final purification of those who died in sin, and this was also the teaching of the illustrious ORIGEN. The Universalists claim also that their doctrine was taught by some of the leading spirits of the patristic period, among whom they reckon Clement of Alexandria, Marcellus of Ancyra, Titus of Bostris, Gregory of Nyssa, Didymus the Blind of Alexandria, Diodorus of Tarsus, Theodore of Mopsuestia, and Fabius Marius Victorinus, and that it was not specially and formally condemned by a council until that of Meunas, held in Constantinople, A.D. 511. In spite of its formal condemnation, and of the softening influence exercised by the doctrine of purgatory, Universalism survived in the church, and occasionally appeared in strength, as among the Albigenses and Waldenses in the twelfth century, the Lollards of Germany

in the fourteenth, the "Men of Understanding" in the fifteenth, and some of the Anabaptist sects in the sixteenth. After the Reformation, when the doctrine of Purgatory had been rejected by the Reformers, the harshness of the theory which assigned a portion of never-ending misery to a large section of the human race, led many persons to adopt the doctrine of Universalism; and to refer to England alone, we find among its supporters, Archbishop Tillotson, Dr. Burnet, Bishop Newton, Dr. Henry Moore, William Whiston, Jeremy White, chaplain to Oliver Cromwell, and author of the "Restoration of All Things," David Hartley, who maintains it in his "Observations on Man," Soame Jenyns, and William Law, the celebrated author of the "Serious Call" and "Christian Perfection." Later supporters of the doctrine include De Quincey, Maurice, and Kingsley, and it is now publicly taught and defended by many persons of eminence in the Established Church. Among dissenters also, the Unitarians are nearly all Universalists, and the doctrine is accepted tacitly or openly defended by many of the Congregationalists and members of other denominations. Universalism began to attract attention in America about the middle of the eighteenth century, and after the arrival of the Rev. John Murray, once an English Methodist, in 1770, it spread with great rapidity. At the present day the American Universalists are a numerous and influential denomination, supporting five colleges, two theological schools, several missionary Sunday Schools and Tract Societies, and numbering considerably over 1000 congregations. They publish numerous periodicals, and issue large numbers of tracts in support of their peculiar views.

To enter into any detailed account of the various forms of Universalist doctrine which have been maintained in former times, would be obviously impossible within the necessary limits of this article, but the following may be taken as a brief outline of the doctrinal system of the Universalists of America:—They believe concerning God that he is infinite in all his perfections, and that he created man with the purpose that his existence should prove a final and everlasting blessing; that all the temptations, transgressions, and strivings of man have been foreseen by the divine wisdom, provided for by the divine power, and watched over by divine love, and that these attributes in their infinite perfection will finally overcome all evil, and bring about universal harmony with the divine will. They also believe in the perfection of the divine justice, and affirm on this ground that God would not impose on finite beings a law infinite in its demands and penalties; but that being perfectly just, he will deal with every man according to his works, whether good or bad. They uniformly reject the doctrine of the Trinity, but many of them adopt the Arian view of Christ, and consider that he was sent of God to be the saviour of the world, and therefore that the work of redemption must be thorough and universal. Concerning sin they hold Pelagian views, believing that all men are formed in the moral image of God, and that this image, though it may be disfigured by sin, can never be wholly lost. Faith and regeneration remove the stains and defilements of sin, and renew or reform the soul in the divine likeness. Salvation, they teach, is not escape from present or future punishment, but is the deliverance from error, unbelief, sin, the tyranny of the flesh and its hurtful lusts, into the liberty and blessedness of a holy life and supreme love to God and man. Finally, on the subject of rewards and punishments, the Universalist belief is substantially that holiness, piety, love of God and man are their own reward, make their own heaven here and hereafter, and that in the nature of things no other reward is possible. If men love God with all their hearts and trust in him, they find and are satisfied with the heaven which love and faith bring with them. Punishment also they consider to be consequential, not arbitrary;

that it is the natural fruit of sin; that it is for restraint, correction, and discipline; and that God loves as truly when he punishes as when he blesses, never inflicting pain in anger, but only because he sees that it is needed to prevent a greater evil. They maintain that pain ordered for its own sake and perpetuated to all eternity would be a proof of infinite malignity; but God is infinitely beneficent, and therefore all suffering must have a beneficent element in it, all punishment must be temporary, and end in good.

See Ballou's "Ancient Universalism" (Boston edition of 1872); Williamson's "Exposition and Defence of Universalism" (New York, 1840); Whittimore's "History of Universalism" (Boston, 1860); and for works of kindred thought, George Macdonald's "Unspoken Sermons" (London, 1877); and Canon Farrar's "Eternal Hope" (London, 1878).

**UNIVERSALS** are those abstract conceptions which we now call *genera*, but which were rendered objective by the Realists of the middle ages, following Plato's doctrine of "Ideas." Plato asserted that there was an abstract man as well as a concrete man, in fact, that men were such only by virtue of their sharing in the universal or ideal man. We can only know individual men, but our reason, selecting the common characters from such diverse individuals, realizes them as universal. This conception Plato and the Realists would consider rather as a *perception*, and out of an abstraction they thus made a substance or an actual existence.

**UNIVERSE.** This name is generally used as the word *world* once was, to signify the collection of all created things. In modern language, *world* generally refers to the earth only, and *universe* to all stars and planets. Before the reception of the Copernican theory, the *world*, which signifies what we now call the universe, was naturally a synonym for the *earth*, which was supposed to be the principal part of the universe, all the other celestial bodies being only satellites. But since the time when other planets have been advanced to the dignity of being separate worlds, the term universe has been gradually introduced into common language.

By the technical term *Theory of the Universe* is always understood what is known of the general arrangement of planets, stars, &c., and of their connection with one another.

**UNIVERSITIES** are lay corporations, which, since the twelfth century, have had the charge of educating the members of the learned professions throughout Europe and the colonies founded by European states. The three oldest learned institutions to which the name university can with propriety be applied are those of Paris, Bologna, and Salerno.

The name *universitas* was not confined in the middle ages to scientific bodies; it was used in a sense equivalent to our word corporation, or nearly so, and this is the Roman sense of the word. In fact the university was not so called because of its embracing the whole round of knowledge, but simply because of its being a comprehensive collection of one class of the community, to wit, students. We read, in fact, in black-letter books, of a "University of Tailors" and the like. It was long before the name obtained its present limited acceptance. The oldest document in which the designation "*universitas*" is applied to the University of Paris is a decretal of Innocent III., about the beginning of the thirteenth century.

To almost every cathedral and monastery of Europe there had been a school attached, from a very early period, in which all candidates for priestly orders, and such laymen as could afford it, were instructed. It appears from the letters of Abelard (died 1142), and from other contemporary sources, that in Paris the poorer establishments intrusted the conduct of this school to one of their number, called the *Scholasticus*; and that the wealthier bodies maintained

a Scholasticus to instruct the junior pupils in grammar and philosophy, and a Theologus to instruct the more advanced in theology. About the time of Abelard the great concourse of students who flocked to the episcopal school of Paris appears to have rendered it necessary to assemble the two classes of pupils in different localities; the juniors were sent to the Church of St. Julian, while the theologians remained in that of Notre Dame. All who had studied a certain time, and undergone certain trials, were entitled to be raised by the rector of the schools to the grade of teachers. This was done by three successive steps. The candidate was first raised to the rank of master, in which he acted for a year as assistant to a doctor (or teacher); then to the rank of *baccalaureus* (bachelor), in which he taught for a year, under the superintendence of his doctor, pupils of his own; lastly, to the grade of independent doctor. According to the custom of those times, the teachers gradually formed themselves into a kind of corporation for mutual support. The corporation consisted of the teachers of all the three grades, and stood under a rector elected by themselves. According to an agreement entered into in 1206, the rector was elected by the residents of the four nations—French, English or German, Picards, and Normans. The disputes between the teachers of theology and those of other matters ended in the secession of the doctors of theology from the university, as it had for some time been called, and to their incorporating themselves into a separate college or faculty. Their example was followed not long after by the doctors of canon law and medicine, who also formed themselves into separate faculties. These faculties consisted exclusively of the actually teaching doctors (*doctores regentes*) of these three branches of knowledge. The masters and bachelors remained members of the university proper, which, from the secession of the theologians, canonists, and doctors of medicine, came in time to be called the Faculty of Arts. From this period the university consisted of seven bodies or sub-incorporations—the four nations under their procurators, and the three faculties under their deans. The rector was the head of the university; he was elected by the procurators of the old university; no doctor of theology, canon law, or medicine, could be elected or take part in the election. At first the rector was chosen by the procurators, but afterwards by four electors, specially elected by each nation for that purpose. At an early period colleges were established within the University of Paris by private families or religious orders. Originally they were intended exclusively for poor scholars, who were to live in them subject to a certain discipline. By degrees, as more numerous and able teachers were employed in these colleges, they assumed the character of boarding-houses for all classes of students. The word *collegium* was at first applied only to the students, it was only much later that it was applied to their hostel; and still later that the latter was the chief meaning of the term.

The oldest authentic document relating to the University of Bologna is the privilege granted by the Emperor Frederick I., at Roncaglia, in November, 1158, to all who travelled in pursuit of learning, in which the professors of law are mentioned in terms of high encomium. Bologna is not named in this instrument, but history mentions no other law-school as existing at that time. The contents of this privilege are twofold: foreign scholars are declared to stand under the emperor's immediate protection, and a special jurisdiction (their teachers, or the bishop of the city) is constituted to judge in all complaints against them. It seems universally admitted that the earliest teacher of civil law at Bologna was Irenæus; he is said to have been originally a teacher of philosophy, but to have acquired such a knowledge of Justinian's compilations that he was invited by the Countess Matilda to expound its doctrines

from the professional chair. The fame of the University of Bologna rests on its law teachers; and from this school the study of the Roman law has been spread over Europe.

Ordericus Vitalis, whose annals close with the year 1141, speaks of Salerno as a place long eminent for its medical schools. Its most celebrated teacher, Constantine of Carthage (died 1087), was a privy councillor of Louis Guiscard. This school was still flourishing in 1224, when the University of Naples was established. All that can be inferred from these scanty notices of the school of Salerno is, that the scientific study of medicine was making rapid strides about the same time that law began to be more systematically studied, and philosophical and literary pursuits to be regarded as the profession of a class whose members might or might not be priests.

The growth of universities throughout Europe was rapid. Before the Reformation they were established in Italy, France, Germany, the Spanish Peninsula, Great Britain, and even among the Slavonic nations east of the Germans. In Great Britain the dates of foundation were:—Oxford, before 1149; Cambridge, 1231; St. Andrew's, 1412; Glasgow, 1454; Aberdeen, 1494. A century afterwards came Edinburgh, 1582; and Dublin, 1591.

In these institutions we recognize the leading features of Paris or Bologna. All of them are privileged corporations, with an independent jurisdiction more or less limited, and the power of making by-laws; and in each the faculties of philosophy (or arts), theology, law (civil and canon), and medicine, are more or less fully developed. Some contain within them all the faculties; some only two or more.

The universities founded after the Reformation adopted in general the organization of their predecessors—the political incorporation, the privileged jurisdiction and power of making by-laws, and the faculties and modes of conferring degrees which custom had established. But the altered circumstances of society modified considerably their external relations. The same political power was not conceded to universities that had formerly been given to them. The old were restricted in their privileges; the new never received them. Other sciences also had their practical utility recognized, in the same way as those of law and medicine had theirs at an earlier period, and the application of mathematical learning to the purposes of war and navigation had given an impetus to its cultivation. These new practical pursuits never produced a new faculty, but they lent greater importance to the miscellaneous one known as the Faculty of Arts. The number of universities founded in Europe, from the time of the Reformation down to the French Revolution, was considerable.

But many events occurred during this period to lower universities in the public estimation. The extension of elementary and secondary schools had raised the standard of education among the classes which did not receive a university education. The invention of printing had operated in the same direction. The diminished privileges and restricted jurisdiction of universities had brought them to be regarded merely as schools of a higher order. The increasing number of learned societies raised up a body of non-academical literati, hostile in many instances to the academical; and the public, looking only to the transactions of these societies, forgot that their members were indebted for their training to the universities. In France the old universities have entirely disappeared. [See UNIVERSITY OF FRANCE.] In the rest of Europe, as soon as the storms of the Revolution were passed over, they revived; and, adapting themselves more to the social necessities of the age, have in many instances started with increased energy on a fresh career of utility.

The universities of the United Kingdom are Oxford, Cambridge, Durham, London, and the Victoria University of Manchester; St. Andrews, Glasgow, Aberdeen, and Edinburgh;

Dublin (Protestant), Dublin (Roman Catholic), and the Royal University of Ireland. They may be broadly divided into three classes, viz.: (1) the residential universities, in which attendance at particular lectures is necessary to the taking of a degree, as Oxford and Cambridge; (2) the non-residential universities, which demand attendance only during certain terms, as the Scottish universities; and (3) those which are simply examining bodies, as London University. In Oxford and Cambridge the colleges have obtained a complete preponderance over the university, and the old university constitution is in practice changed. So great has been the change that many people, and even some learned judges, have erroneously conceived these two corporations as composed of a number of colleges something like a federal government, whereas the universities are distinct lay corporations, which confer degrees and have various powers; the colleges are properly boarding-houses and eleemosynary foundations. Oxford certainly existed as a university in the full sense of the word as early as 1149. The earliest charter of privileges to the University of Oxford as a corporation is said to be the 28th of Henry III. (colleges are said to have existed in that city as early as the time of Alfred the Great), and the first charter granted to the University of Cambridge as a corporation is said to be the 15th of Henry III. James I., in 1603, by diploma dated the 12th of March, granted to the universities of Oxford and Cambridge the power to send each two representatives to the House of Commons. (The University of Dublin also sends two, and by the Reform Bill of 1867 one was assigned to that of London.) The University of Dublin consists of Trinity College only, incorporated under Queen Elizabeth in 1591. The Roman Catholic University of Dublin was founded in 1851, and has several affiliated colleges. The Royal University of Ireland, founded in 1880, superseded in 1882 the Queen's University, which consisted of the Queen's Colleges at Belfast, at Cork, and at Galway. The Dean and Chapter of Durham, by an act of chapter, 28th of April, 1831, established an academical institution in Durham in connection with the cathedral church, which by an Act of Parliament (2 & 3 Will. IV.), entitled "An Act to enable the Dean and Chapter of Durham to appropriate part of the property of their church to the establishment of a university in connection therewith for the advancement of learning," was confirmed and endowed. In 1833 the University of Durham obtained a royal charter.

Scotland possesses four universities, namely, those of St. Andrews, Aberdeen, Edinburgh, and Glasgow, and the general regulations as to graduation are common to all. The University of Edinburgh was founded in 1582 by a charter granted by James VI. of Scotland, and in 1621 the Scottish Parliament ratified to it all the privileges enjoyed by other universities in the kingdom. This ratification was confirmed in the treaty of Union between England and Scotland, and again in the Act of Security. The constitution was, however, modified by the Act (1858) relating to the Scottish Universities, and the University of Edinburgh is at the present time a corporation consisting of a chancellor, rector, principal, professors, registered graduates, alumni, and matriculated students. The students matriculating each year now amount to more than 2000. The essential qualification to graduation at a Scottish university is attendance at certain special series of lectures or classes. The course for the Arts degree extends over four winter sessions, each lasting from the beginning of November till about the middle of April; and the degree of M.A. is conferred on all who have completed their course and passed the ordinary examinations.

The University of St. Andrews was founded by Henry Wardlaw, bishop of the diocese, in 1411, and was confirmed by a Papal Bull of Benedict XIII. in 1413. During the fifteenth and sixteenth centuries three colleges were estab-

lished in connection with it, viz., St. Salvator (1455), St. Leonard (1512), and St. Mary (1537). All the colleges had originally teachers both in philosophy (or arts) and in theology, but in 1579 the two older of them were confined to philosophy, and that of St. Mary to theology. In the year 1747, St. Leonard and St. Salvator were united by Act of Parliament. The Universities of Edinburgh and St. Andrews unite in sending a representative to Parliament.

The University of Glasgow was founded by a Bull of Pope Nicholas V. (1450-51), with the power of creating doctors and masters, and enrolling readers and students, the whole of whom were to enjoy the same rights and privileges as the University of Bologna. At first it had neither property nor endowment, but in 1460, James, Lord Hamilton, bequeathed to the then regent and his successors a tenement in the High Street, with 4 acres of land adjoining for the "use of the College of Arts." Between 1577—when a new charter was issued—and the Restoration, the university flourished in every way, but the re-establishment of Episcopacy detached from it a large part of its revenues, and many of its professorships were abandoned. In 1864 the old buildings were sold for £100,000, and a government grant of £120,000 was obtained; these amounts, together with public subscriptions and college funds, were laid out in the new buildings now to be seen at the west end of the city. The University of Glasgow was reconstituted by the Act of 1858, and, conjointly with the University of Aberdeen, sends one member to Parliament. The present University of Aberdeen derives its origin from two distinct foundations, viz., University and King's College of Aberdeen, founded in 1194 by William Elphinstone, bishop of Aberdeen, under the authority of a Papal Bull; and Marischal College and University of Aberdeen, founded (1593) by George Keith, Earl Marischal, by a charter afterwards ratified by Act of Parliament. In 1860 the two foundations were united under the title of the University of Aberdeen.

The University of London received its first charter from William IV., and its present one from Queen Victoria in 1837. [See UNIVERSITY OF LONDON.] The Victoria University of Manchester was incorporated under Queen Victoria in 1880.

The following are the dates of the foundations of the chief European universities in alphabetical order:—

England—Cambridge, 1231; Durham, 1083; London, 1836; Oxford, 886 (?); Victoria (Manchester), 1880.

Scotland—Aberdeen, 1494; Edinburgh, 1582; Glasgow, 1451; St. Andrews, 1412.

Ireland—Dublin, 1591; Roman Catholic, 1851; Royal, 1880.

Germany—Berlin, 1810; Bonn, 1786; Breslau, 1702; Erlangen, 1743; Freiburg, 1457; Giessen, 1607; Göttingen, 1734; Greifswald, 1156; Halle, 1694; Heidelberg, 1386; Jena, 1558; Kiel, 1665; Königsberg, 1541; Leipzig, 1409; Marburg, 1527; Munich, 1826; Rostock, 1419; Strasburg, 1621; Tübingen, 1177; Würzburg, 1403.

Austria—Cracow, 1364; Grätz, 1586; Innsbruck, 1672; Lemberg, 1784; Pesth, 1781; Prague, 1348; Vienna, 1365.

Switzerland—Basel, 1460; Bern, 1834; Zürich, 1832.

Italy—Bologna, 1158; Cagliari, 1720; Catania, 1445; Genoa, 1812; Macerata, 1290; Messina, 1548; Naples, 1224; Padua, 1222; Palermo, 1447; Parma, 1599; Pavia, 774 (?); Pisa, 1339; Rome, 1215; Sassari, 1620; Siena, 1320; Turin, 1405.

Spain—Barcelona, 1450; Granada, 1581; Madrid, 1836; Oviedo, 1580; Salamanca, 1200; Santiago, 1504; Saragossa, 1474; Seville, 1502; Valencia, 1410; Valladolid, 1346.

Portugal—Coimbra, 1251.

Netherlands—Groningen, 1614; Leyden, 1575; Utrecht, 1636.

Belgium—Brussels, 1834; Ghent, 1816; Liège, 1817; Louvain, 1426.

Denmark—Copenhagen, 1478.

Sweden—Lund, 1668; Upsal, 1477.

Norway—Christiania, 1811.

Russia—Dorpat, 1632; Helsingfors, 1827; Kazan, 1811; Kharkov, 1804; Kiev, 1834; Moscow, 1755; Odessa, 1865; St. Petersburg, 1819; Warsaw, 1816.

Greece—Athens, 1837.

**UNIVERSITY COLLEGE, LONDON** (formerly *London University*). University College, London, had its origin in a project which was first promulgated in the year 1825. The object proposed was to found a university in London by means of public subscription. One of its main purposes, and which was from the first warmly supported by Lord Brougham, who up to his decease in May, 1868, held the office of president of the council, was to afford the opportunity of obtaining a university education to the various classes of society in England who, not being members of the Church of England, were then excluded in a greater or less degree from Oxford and Cambridge.

The proposal was favourably received. In a few months the funds were raised by subscriptions for £100 shares, and by a few donations of £50 each. In the autumn of the same year a freehold site was obtained in Gower Street, for which £30,000 was paid, and the first stone of the building was laid on the 30th of April, 1827, by his royal highness the Duke of Sussex. By the end of 1828 the institution was in full operation.

In 1830 an application was made to the crown for a charter, but the grant was successfully opposed by the Universities of Oxford and Cambridge. In 1833 the application was renewed, as was also the opposition, with the additional opposition of the College of Surgeons; the case was heard before the Privy Council in 1834, but before a decision was obtained a change of government took place, and the question remained undecided, when, in March, 1835, on a motion by Mr. W. Tooke, who at that time was the treasurer of the college, the House of Commons voted an address to his Majesty, in opposition to the ministers, praying him to grant a charter. King William replied that the Privy Council should be called on to report; but still nothing was done until Lord Melbourne again succeeded to office, when, in August, 1835, the chancellor of the exchequer made a proposal for founding a University of London for the purpose of examining and granting degrees not only to students in this college, but to others of all religious persuasions without distinction, and without the imposition of any test or disqualification whatever. The proposal was agreed to, and carried into effect in the following year, and on the same day this college received a charter under the title of University College, London. From its commencement to this time it had been styled the London University.

The council, consisting of the president, the vice-president, and twenty-one other members, has the general management of the affairs of the college. The senate consists of the professors of the college, with a president and two vice-presidents, who must be members of the council. The senate determines on the courses, and regulates the time of instruction. There are twenty-five professorships in Arts and Laws, and fifteen in the various branches of the medical art. The whole range of college tuition is given, except divinity, with the addition of much fuller instruction in science and modern languages than was before given in colleges.

Evening classes have been instituted for others than regular students. None of the professors' chairs are publicly endowed, those gentlemen being remunerated solely by

their class fees. Among the past professors of Arts and Laws have been such men as Austin (Jurisprudence), Panizzi, Latham, George Long, Ramsay (Geology), Sylvester, Key, De Morgan, F. W. Newman, Tom Taylor, Arthur Hugh Clough, David Masson, Malden, Sedley, Williamson, and Henry Morley; and it is no wonder that with such a teaching staff University College has acquired a peculiarly high reputation. Opposite to the college, on part of the ground belonging to it on the west side of Gower Street, is an hospital erected in 1831 by public subscription, chiefly among the proprietors, at the cost of about £10,000, for the purpose of affording the medical students clinical instruction under the superintendence of the professors and other members of the hospital staff. It is supported by public contributions. The medical school of the college is one of the most celebrated in the kingdom. The past medical professors include Sir Charles Bell, Professor Graham (afterwards master of the mint), Liston (the famous surgeon), Dr. Anthony Todd Thomson, Dr. Lindley, Dr. C. J. B. Williams, Dr. Parkes, Dr. Carpenter, Dr. Jenner, Dr. Sharpey, Dr. J. Russell Reynolds, Professor Quain, Professor Erichsen, Professor Marshall, and Sir Henry Thompson.

Under the original deed of settlement University College was nominally, although not actually, a joint-stock institution, but under the present constitution, framed in accordance with an Act of Parliament passed in 1869, it is not now even nominally the property of shareholders having pecuniary or other beneficial rights. The proprietors are now governors with substantially the same voice as they always had in the direction of the college, but are divested of the fictitious character of joint-stock traders. In other respects the provisions of the Act were adapted not only to the past, but also to the future growth of the college, for among other things it enabled it to "give instruction in the fine arts as well as in literature and science, removed all restriction as to the age or sex of students, and "in the broadest interests of education left it to advance at equal pace with the foremost of the sound thoughts of the day." In accordance with the permission thus granted, classes for ladies in nearly every subject are now taught in the college with great success. In 1887 there were, in all, over 1250 students in the college.

The public school connected with the college is under the control of the council, and is conducted by a head master appointed by them, who has the rank and privileges of a professor in the college, and by a vice-master. There are about forty assistant masters and over 700 pupils in University College School.

The college was to consist of a centre and two wings, but the centre only was first built. The wings were, however, constructed in 1878-79, the foundation stone having been laid on the commemoration of the jubilee of the college. The front is of two floors, with a Corinthian order of pilasters on the upper story. The grand entrance is by a pseudo-triptostyle portico, of rich architectural character, of the Corinthian order, having ten columns in front. It is elevated on a lofty stylobate ascended by flights of steps, and leads to an octangular vestibule surmounted by a dome which externally rises behind the pediment of the portico. The vestibule is now called the Flaxman Gallery, having been fitted up for the exhibition of the original casts of most of Flaxman's principal works. The lecture rooms are four semicircular theatres, each 65 feet by 50; four oblong rooms, each 46 feet by 24; with other class-rooms of smaller dimensions. There are two spacious laboratories for chemistry and pharmacy. On each hand of the vestibule on the upper storey is a room 120 feet by 50, one of which has been divided into class-rooms for the school; the other, to the north of the portico, has been fitted up as a spacious anatomical museum. The libraries altogether contain about 75,000 books and 15,000 pamphlets. The

general library, consisting of upwards of 50,000 volumes, occupies a building designed by Professor Donaldson, which stands at right angles to the centre of the main building, and eastward of it. The Chinese Library, collected by the late Dr. Morrison, is possessed by this college; it contains about 10,000 volumes. The museums of philosophical apparatus, of chemistry, anatomy, geology, and natural history are amply provided for the purposes of instruction. The portion of the building on the south side of the portico is devoted to instruction in the subjects of the Faculty of Arts and Laws; that on the north to the subjects of the Faculty of Medicine. In the east court of the north end is a spacious, well-lighted hall, 95 feet long, 28 wide, and 24 high, for the study of practical anatomy, and adjoining is the Birkbeck Laboratory, fitted up for the instruction in practical chemistry and in chemical manipulations, distinct from other laboratory pursuits. The Slade School of Fine Art occupies most of both floors of the north wing. There is a special women's reading-room, and lady superintendents' rooms, &c., for the growing requirements of the ladies' classes. A large number of societies exist in the college, as might be expected among so numerous a body of students. The chief of these are the medical society, the debating society, the chemical and physical society, the women's debating society, the musical society (for both sexes), the university college society (for social objects), the reading-room society, and the women's reading-room society. The subscription to most of these is a few shillings a term.

#### UNIVERSITY EXTENSION. I. Cambridge

*Scheme:* In 1872 the University of Cambridge, in response to many memorials from large towns, appointed a syndicate to "organize lectures in popular places." The scheme grew rapidly, and the syndicate has conducted lectures in more than sixty towns. The classes are very large and the fees are low—five shillings for a course of twelve lectures and class teaching being about the average; and the lecturers are men of university standing, who give lectures of nearly the same character as they would deliver at the universities themselves. In some cases these lectures have led to the foundation of permanent educational institutions. The most splendid instance is that of Nottingham, where in 1880 an anonymous donor gave £10,000, which the town council accepted, on condition that a University College should be provided to the satisfaction of the University of Cambridge, as a permanent home for the extension movement there. This has been done, and is now in a very flourishing condition. Similar results have followed on a less scale in Chesterfield, Liverpool, Sheffield, and elsewhere.

*II. Oxford Scheme:* The University of Oxford long lagged behind the sister university in this great work; but from the first had kept a few centres going. However, about 1885 Oxford took up the matter earnestly, and soon made her lecture scheme worthy of herself. Even yet it has not more than half the dimensions of the Cambridge scheme.

*III. London Scheme:* Many university men resident in London saw their way to applying in and around the metropolis what had been thus so successfully carried out in the great towns of the north. Sir Thomas Gresham had intended in his famous bequest, dating from Elizabeth's reign (1579), to bring university teaching to the doors of the citizens of London, and intrusted funds to the Mercers' Company for that purpose, though these have been frittered away for many years in the "Gresham Lectures," which are of very small practical utility, and are given to audiences of extremely limited numbers, quite contrary to the beneficent intentions of the founder. In 1878 some London residents secured the co-operation of the three universities of Cambridge, Oxford, and London, each university agreeing to nominate three distinguished persons as a "joint board," and the joint board of nine undertaking to select lecturers, examiners, &c., and to advise generally. The chairman

was Professor James Stuart, afterwards M.P. for Hackney. A society was formed for the management of the scheme, called the London Society for the Extension of University Teaching, with the Right Hon. G. J. Goschen, M.P., as its president, and with a council of twenty-two elected members of very high educational distinction, to whom are joined ten delegates from the great London educational institutions, the Royal Institution, the London Institution, Bedford, King's, Queen's, University, and other colleges, &c. Any place in or near London may constitute itself a centre of this society without any further membership or formality, and may apply for a lecturer on any of the recognized subjects, the council cordially co-operating in every way. The local expenses and hire of rooms fall entirely upon the local centre, and therefore in every case there is formed a local fund, or a guarantee to cover possible deficiencies. Thirty such centres are at work, and the fees charged range from a shilling to a guinea for the course, though the teaching is of the same excellence in every case. In 1887, for instance, there were four courses in Whitechapel (fee one shilling), and the number of their students varied from 100 to 150 each. Of course this centre is a very poor one, and is largely aided by subscriptions and grants. The richer centres have higher fees, and are self-supporting. The lectures are in courses of ten or twelve, are always accompanied with class teaching, and conclude with an examination (free) by some independent examiner. As a rule, 2000 to 2500 students are at work under the London scheme. The session (of two terms) covers a little more than the six months, from October to March. The offices of the parent society are at the Charterhouse.

#### UNIVERSITY OF FRANCE.

This rose from the famous mediæval University of Paris, the oldest and greatest of universities, which in its turn arose from the constant care and protection granted to scholarships by the Abohiminded emperor, Karl the Great. Paris University owed its early celebrity to the teachings of William of Champeaux, who taught logic in Paris in 1109, and of Abelard, his pupil and rival. Peter Lombard, a student of Bologna and afterward of Paris, taught theology there in the same century, and added to its reputation; and it is said that its students in 1150 exceeded the citizens in number. These were connected with many different schools, some of which were appendages of the churches and monasteries in and around Paris, and some private schools gathered around noted lecturers. Towards the end of the twelfth century all were formed into a corporate body by King Philip Augustus, but it does not appear that the term university was applied to it before the beginning of the thirteenth century. It is probable that it had formed several organizations previous to this consolidation, for the students of the arts and sciences were divided as early as 1169 into four provinces or nations: the French nation, including, besides French, natives of Spain, Italy, and Greece; the Picard, students from North-east France and the Netherlands; the Norman, those from West France; and the English (called German after 1430), those from England, Ireland, Scotland, and Germany. Each nation was governed by a procurator. The university comprised at first but two faculties, that of arts and sciences and that of theology; law and medicine were added in the thirteenth century. Each faculty, excepting that of arts and sciences, had at its head a dean, and the three deans and the four procurators constituted a council, in which, under the presidency of the rector, who was elective, was vested the government of the university. The power of conferring degrees belonged to the chancellor alone. Academic degrees were conferred as early as the middle of the twelfth century, and probably before, but their origin is unknown. At first the degree of master was synonymous with that of doctor, and was conferred on those who were



competent to teach; but afterwards the former was confined to those who taught the arts, and the latter to those who gave instruction in theology, law, or medicine. Pope Nicholas I. gave the university the power of endowing its graduates with the privilege of teaching everywhere. For the doctor's degree in divinity nine years' additional study was required. As many of the thousands of students who annually flocked to Paris were poor, colleges were early established by individuals and by religious orders, where at first free board and lodging only were dispensed; but many of them finally became places of instruction also. Towards the close of the fifteenth century there were eighteen large colleges belonging to the faculty of arts, and eighty smaller ones. At this time nearly all students belonged to some of the colleges. Those who were unattached to any were called *martinets*. The University of Paris was endowed with extraordinary privileges, and was so powerful that it sometimes resisted even the royal authority. It did not acknowledge the jurisdiction of ordinary judges, but had its own courts and its representatives in the States-general. During the wars of the League it lost its political importance, and though still most important as a centre of culture, fell much under priestly and aristocratic influences. Therefore, under the great republic it was suppressed in 1793 by a decree of the Convention. Napoleon I. by the law of 1806 and the decrees of 1808 and 1811, re-established it as a national organization, embracing all public instruction, under the name of the University of France, at the head of which was a grand-master, assisted by a university council. This great institution monopolized all higher instruction until 1875, when the law permitting the establishment of universities independent of the state was passed. But the University of France is still maintained, and has twenty-seven subordinate academies, many of which were in olden times complete universities in themselves, the chief of which are: Aix, Besançon, Bordeaux, Caen, Chambéry, Clermont, Dijon, Douai, Grenoble, Lyons, Montpellier, Nancy, Paris, Poitiers, Rennes, and Toulouse. A complete academy, like that of Paris, has the five faculties of theology, law, medicine, science, and letters; but most of the other provincial centres have only three or four faculties. The Academy of Paris has a very large corps of professors, and usually from 7000 to 8000 students. The provincial academies average about 1500 students. The University of France, which alone has the power to confer degrees, is now under the direct control of the minister of education. A new Roman Catholic university was projected in Paris in 1875. The other ancient universities of France were all suppressed with that of Paris in 1793. Besides the university work proper of the academies, the University of France has control over the whole educational system of France, and exercises its control through the various provincial academies, to each of which two or three departments of France are allotted. Besides this there are the *écoles normales*, the *lycées*, the colleges, &c. The Collège de France, and a few special literary and scientific institutions, are alone free from the rigorous control of the University of France.

**UNIVERSITY OF LONDON.** The University of London owes its establishment to the formation of what was at first called the London University, and is now UNIVERSITY COLLEGE, London, succeeded as it was by the institution of KING'S COLLEGE. In order to promote the objects of these schools it was found necessary that a body should be formed with the power and means of examining the students, and the right of conferring degrees. The original charter given by King William IV. was a temporary one. Queen Victoria, in the first year of her reign, revoked it, and granted a new one; additional powers were given in 1850; a wholly new charter in 1858; and the charter now in force, superseding all others, bears date 6th January, 1863. There is a supplemental charter, dated 4th March,

1878, admitting women to degrees, but leaving it to convocation (the general body of graduates) to say whether they should be members of that body. It is scarcely necessary to say that they were cordially welcomed by convocation as soon as they were qualified. The reasons for this succession of charters was that experience gradually suggested changes in the organization. One of the most natural of these was, that when a body of London University graduates had once been formed it was found necessary to admit them to some share in the government of the university of which they were the offspring. Accordingly the university now consists of a chancellor, vice-chancellor, a senate of thirty-six fellows, and the body of graduates. The chancellor, vice-chancellor, and fellows really rule, and make whatever fresh changes from time to time the charter has left to their discretion; but the graduates in convocation have a deliberative power on all matters concerning the university, and also a certain power in the nomination of new members of the Senate. The influence of convocation is already great, and is growing greater. With all these changes the university still remains essentially what it was in the first instance—not a teaching body, not a body growing out of or representing any group of teaching bodies, like the universities of Oxford and Cambridge, and those of Scotland, but simply an institution for ascertaining, by means of examination, those persons in any part of the British dominions who have acquired proficiency in literature, science, and art, and of rewarding them by academical degrees. The queen is the visitor, and to the crown is reserved the power of from time to time appointing any number of fellows; but in case the number shall be at any time reduced below twenty-five, exclusive of the chancellor and vice-chancellor, the members of the senate may elect twelve or more persons to be fellows in order to complete the number of thirty-six fellows, besides the chancellor and vice-chancellor. The chancellor is appointed by the crown. The office of vice-chancellor is an annual one, and is filled by election by the fellows from their own body. The Reform Act of 1867 conferred on the university the privilege of sending a member to represent it in the House of Commons. The executive officer of the senate is the registrar.

An examination for degrees must be held once a year at least. The candidates are examined in as many branches of general knowledge as the senate shall consider most fitting—in short, in every subject of a liberal or professional education, excluding only theology. The examiners are appointed by the senate, either from their own body or otherwise. The senate confers, after examination, the degrees of Bachelor of Arts, Master of Arts and Doctor of Literature, Bachelor of Laws and Doctor of Laws, Bachelor of Science and Doctor of Science, Bachelor of Medicine and Doctor of Medicine, Bachelor of Surgery and Master in Surgery, Bachelor of Music and Doctor of Music. It also examines in the history and art of teaching, in subjects relating to public health, and in Scripture and evidences of the Christian religion, granting special diplomas in these various subjects, but not, as yet, degrees. It must be evident that in an institution such as the one under notice—which is, in fact, a first-class examining body, empowered to grant degrees—everything must depend upon the examiners; and the highest functions of the senate are the election of these gentlemen, and the discussion with them from time to time of the proper methods and subjects of examination. At present there are nearly eighty examiners. They are arranged in pairs, so that there are two examiners to each of twenty designated subjects. The examiners are appointed but for a limited term, so that there may always be a reinforcement among them of fresh men. The present body of the examiners includes men of the highest distinction, some of them graduates of the university itself, others of Oxford, Cambridge, or Dublin, or one or other of the Scottish uni-

versities, and that the examinations have ever been of a very superior quality is proved by the value everywhere set on a London degree.

The various examinations for arts, laws, and medicine are held yearly, but at different times. The examiners receive salaries fixed by the senate, subject to the approval of the ministers of the crown. The expenses are defrayed, partly by a grant from the government, and partly by the fees paid by students on examination. There are a few scholarships in the gift of the university.

A list of institutions for which the university receives certificates for degrees in medicine, and of others in connection with it as to degrees in arts and laws, is annually published in the *Calendar*; but the necessity of obtaining a certificate from one of the latter, previous to examination, is now in reality dispensed with. It is true the charter of 1863 still binds the authorities to require from candidates for the degrees of medicine and surgery certificates of a certain amount of instruction at a medical school—it being felt that it would be injudicious to qualify surgeons and doctors of medicine merely by examinations calculated to ascertain proficiency, without caring where or how that proficiency had been attained. But for the degrees in arts, laws, and science, no such qualification is needed. The charter certainly ordains that the authorities shall admit as candidates persons who shall produce satisfactory evidence that they have completed in any of the "said institutions (i.e. the institutions in the adopted list) the course of instruction which the said chancellor, vice-chancellor, and fellows shall from time to time by regulations in that behalf determine." Then, however, the charter goes on to ordain also that persons *not* educated in any of the said institutions shall be admitted as candidates for matriculation and degrees. Putting the two clauses together, therefore, it is evident that all persons, whether educated or not at any of the specified schools and colleges, may become candidates for any degrees other than medical and surgical; and that it is left very much to the senate to determine what difference, if any, should be made in favour of those who had been educated at any of the adopted institutions. As a matter of fact the senate have now practically swept away all distinctions, with these exceptions—(1) That persons who are already graduates in arts in any of the universities of the United Kingdom may skip the matriculation examination, and become candidates at once for the B.A. degree or the B.Sc. (Bachelor of Science) degree, or the LL.B. degree in the University of London; (2) that persons who have already graduated B.A. in any of one the four universities of Oxford, Cambridge, Dublin, or Durham, may, after an interval of a year from such graduation, become candidates for the M.A. degree in the University of London. (The M.A. degree at Oxford and Cambridge is obtained without a special examination. Every B.A. who remains technically a member of the university becomes M.A. by the lapse of time, but the M.A. of London, in either of its three forms—classics, mathematics, or moral science—is an exceedingly severe examination.) With these exceptions, so far as arts, laws, science, and literature are concerned, the University of London really places the whole outside world on an equal footing, and it is all the same to it whether the man who presents himself for examination has been attending any of the colleges or schools in special connection with it, or has been acquiring knowledge by private industry. Its sole test of worthiness is its own examination. To make the university still farther useful to persons living in the provinces, examinations for matriculation and for the degrees of B.A. and B.Sc. are now annually held at Manchester, Liverpool, and Carlisle, conducted by sub-examiners simultaneously with the examinations in London, and applications for such local examinations are invited by the senate from other towns and cities. The papers of questions at these pro-

vincial examinations are, of course, the same as those used in London, and the answers are sent to London to be examined.

For many years the University of London had no building of its own, but was quartered in a wing of Burlington House. In May, 1870, however, a very handsome edifice, which had been erected for it by the government, was opened by her Majesty. The principal façade, which fronts Burlington Gardens, is Palladian of a very ornate character. The material is Portland stone, with columns, &c., of red Mansfield stone, and enriched string-courses of Hopton stone, which is considered to answer better for carved work. The front presents a central portion about 120 feet in length, flanked by two square towers, and extended further east and west by wings, that appear externally to be two storeys in height, and are about 65 feet in length. The towers carry a clock and a wind dial, and between them is a projecting portico with five entrances. The portico, the centre, and the wings are all surmounted by balustrades, and on the pedestals of these balustrades are placed statues of eminent men, selected as fitting illustrations of the various forms of academic culture. The statues over the portico are seated, those on the roof line are standing; and there are also standing figures in niches on the ground floor of each wing. The principal figures are those on the balustrade of the portico, and, taking them in their order from east to west, they are statues of Newton, Bentham, Milton, and Harvey, as representatives of the four faculties—science, law, arts, and medicine. The figures on the central roof line represent ancient culture, in the persons of Galen, Cicero, Aristotle, Plato, Archimedes, and Justinian. The east wing is devoted to illustrious foreigners. At the roof line are Galileo, Goethe, and Laplace; and in the niches, Leibnitz, Cuvier, and Linnæus. The west wing is adorned with English worthies—Hunter, Hume, and Davy, on the balustrade, and Adam Smith, Locke, and Bacon, in the niches. The effect of these statues is, on the whole, extremely fine, more especially of those on the balustrades. The basement of the building is massive and simple, but relieved from taintness or formality by the columnar treatment of the centre, and the niches and statues in the wings. Opposite to the centre of the portico is the principal entrance, and immediately within this entrance are rooms on the right and left, lighted by windows looking into the portico. One of these rooms is fitted as a waiting-room, and another as a museum of typical specimens. Passing between door, leading to these rooms, the visitor reaches a fine corridor running east and west, and crossing this corridor, arrives at the foot of the principal staircase. On the right or western side the corridor leads to the great library or examination hall, a room 72 feet by 53 feet, which occupies the whole of the corresponding wing. On the left or eastern side, the corridor leads to the theatre or lecture-hall, which occupies the whole of the eastern wing, and is capable of seating 800 persons. It has a width of 2 feet 5 inches between the seats, so that visitors have no difficulty in moving past others to their places. The theatre was carefully planned with regard to its acoustic properties, and is used for other public purposes besides those immediately connected with the university. At each end of the corridor is a transverse passage, and these passages give access to the smaller examination halls, which are situated behind the main building, at the extremities of the southern or secondary block, and are separated by private rooms for the use of the examiners. The principal staircase is contained within a hall devoted to it, 33 feet square, and rising to a lantern storey of arches and two light windows surrounded by an ornamental skylight. A central flight of steps leads to a first landing, from which secondary flights spring right and left to second landings, and from these the terminal flights ascend to the main landing of the first floor. On the second



landings are two entrances to the smaller library, which is used as a reading-room or common-room for the general use of graduates. The stairs themselves are of fine proportions, and they have richly carved marble balusters surmounted by a dark-coloured polished marble handrail. The floor of the main building is of polished marble, inlaid in various colours. This landing gives access in the centre to a very handsome senate room, 43 feet by 27 feet, and 26 feet 5 inches high. On either side of it are smaller rooms for committees, and for the registrar and assistant-registrar of the university.

The portico and spacious ground-floor corridor were specially planned to afford waiting accommodation for students in the intervals between the morning and afternoon examinations, or at other times when they may require to remain in or about the building. The common-room for graduates supplied a want that had been greatly felt, and affords to all those gentlemen a place for meeting, for the discussion of topics of common interest, and for the practical realization of the bond by which they are united. The architect of the building was Mr. Pennethorne.

**UNKIAR-SKELESSI** ("landing-place of the emperor"), a village of Asia Minor, on the Bosphorus, 8 miles N.N.E. of Constantinople, which gives its name to a treaty concluded here between Russia and Turkey in 1833. The treaty was one of mutual defensive alliance, but by a separate and secret article the sultan agreed to close the Strait of the Dardanelles against all foreign vessels of war. The stipulations of the treaty of Unkiar-Skelessi were annulled by the terms of that concluded at London, 13th July, 1841.

**UNLIMITED.** This term is frequently used by mathematical writers, in the same manner as *Indefinite*, to avoid the entrance of the word *Infinite*. It is also used to describe a problem which may have an infinite number of answers, and which is called an Unlimited Problem.

**UNLUCKY DAYS.** Besides the universal superstition against Friday, which gave of itself fifty-two unlucky days to the year, our ancestors had several unlucky days, selected apparently in the most capricious manner. Most unfortunately the reasons for the condemnation of these unlucky days are never, or with exceeding rarity, given. We do not know if they are commemorative or selected by painful experience; we only know that in every season of the year they existed - days on which no important thing ought to be done, and especially nothing begun.

In antiquity such days were decreed by the augurs on observations of the sacred signs, but we may pass by those times in favour of our own forefathers. Before the Conquest we find in one of the Cotton MSS. of the British Museum (Vitell. c. viii. fol. 20), the last Monday in April, the first Monday in August (alas, that it should now be a bank holiday!), and the third Monday in December, named as days on which if a man should take blood of man or of beast in any manner whatever his life should cease within a week.

So also in the ancient Calendar of Exeter, of the twelfth century, the first of January is emphatically marked as a *dis mala*; and altogether these ancient English chronicles give on the average twenty-four unlucky days in the twelve-month, say one a fortnight, a rather serious deduction from the business days of the year.

This moderation, however, did not endure, and we find them growing in number and in influence as we come later, until the Reformation brought a better light to bear upon the dark places of the land. But in the century immediately preceding that era the old books are full of lists of the kind. We may take as an example the following from a calendar of the time of Henry VI., only modernizing the spelling:—

"These underwritten be the perilous days for to take any sickness in, or to be wedded in, or to take any journey

upon, or to begin any work on, he that would well speed. The number of these days in the year be thirty-two; they be these:—

"In January there be 7, . . .	1, 2, 4, 5, 7, 10, 15.
In February be 3, . . .	6, 7, 18.
In March be 3, . . .	1, 6, 8.
In April be 2, . . .	6, 11.
In May be 3, . . .	5, 6, 7.
In June be 2, . . .	7, 15.
In July be 2, . . .	5, 19.
In August be 2, . . .	15, 19.
In September be 2, . . .	6, 7.
In October be 1, . . .	6.
In November be 2, . . .	15, 16.
In December be 3, . . .	15, 16, 17."

To which the old writer adds in a bold handwriting—*Sed tamen in Domino confido* (Notwithstanding which, I will trust in the Lord).

It is evident to anyone who will study the above typical list that there is no discoverable reason for its selection. It is extremely probable that the tradition as to many of the days is of prehistoric antiquity, lost in the abyss of time, and that the list was gradually enlarged by various observers, as time chanced to add cases of coincidence of date sufficient in number to mark out some day or other of the calendar as an unlucky day.

**UNREASON, ABBOT OF.** In Scotland, previous to the Reformation, it was the custom to elect a president of the Christmas revels, under the name of the Abbot of Unreason, who was consecrated with mock rites in the church itself, and allowed to burlesque the sacred office and parody the divine hymns. The apathy of the clergy to these indecent exhibitions, as Sir Walter Scott shrewdly says in a note in the "Abbot" (a novel in which he makes powerful use of this extraordinary custom), "forms a strong contrast to the sensitiveness with which they regarded any serious attempt, by preaching or writing, to impeach any of the doctrines of the church. It seems as if the churchmen had endeavoured to compromise with the laity, and allowed them occasionally to gratify their coarse humour by indecent satire, provided that they would abstain from any grave question concerning the foundation of the doctrines on which was erected such an immense fabric of ecclesiastical power."

The corresponding functionary in England was called the **LORD OF MISRULE**.

**UNST**, the northernmost of the **SHETLAND ISLANDS** of Scotland, is 11 miles in length, with an average breadth of between 3 and 4 miles, and covers an area of about 36 square miles. It is separated from Yell on the south-west by a strait about a mile across. The population of the island in 1881 was 2173. The shores are much indented with bays and creeks, and around the coast are numerous natural caves. The surface is level, and includes 2000 acres of arable and an equal quantity of pasture land. The latter is mostly covered with a short tender heath, affording excellent feeding for sheep. The soil is, on the whole, tolerably fertile, and a valley containing fresh-water lakes extends throughout the whole length of the island. The minerals comprise gneiss, serpentine, schists, talc, limestone, asbestos, and chromate of iron. The inhabitants are chiefly employed in fishing and agriculture, but some manufactures of Shetland wool are carried on. There are a parish church, two Free churches, and a Wesleyan Methodist chapel. The principal harbours are Uyea Sound on the south, and Balta Sound on the east.

**UNTERWALDEN**, a canton of Switzerland, bounded N. by the Vier Waldstätter See, or Lake of Lucerne. W. by Lucerne, S. by the Bernese Oberland, and E. by Uri. The area is about 295 square miles, and the population in 1880 was 27,318. The canton is bordered and intersected in

all directions by mountain groups or isolated masses, few of which, however, rise above the snow-line. Their general slope is towards the north, as they attain their greatest height in the south, and thence descend gradually towards the Lake of Lucerne. These hills form two parallel valleys, each about 15 miles in length. The eastern valley is drained by the Engelberg Aa, a torrent which flows by the Abbey of Engelberg, and enters the lake below Stanz. The western valley is drained by the Sarner Aa (the outlet of the little Alpine lake of Lungern), which, after passing through the Lake of Sarnen, enters that of Lucerne below Alpach. The lower part of the eastern valley constitutes the district called Nidwald, or below the forest, and the western valley, with the upper part of the eastern one, forms the district called Obwald, or above the forest. These designations relate to the Kernwald or forest of Kerns, which lies on the border of the two districts. The Obwald and Nidwald have formed two separate communities since 1150. They both joined Schwyz and Uri in the insurrection of 1308; and when the first federal union was entered into at Brunnen in December, 1315, they were recognized as forming together one canton, by the name of Unterwalden. They retained their separate existence as independent communities, but figured as only one canton, having one vote in all federal affairs, and this arrangement has continued in force to the present time. Both divisions have their local parliament, composed of all the inhabitants of twenty years of age, who meet in the open air late in spring, and pass new laws, pay accounts, impose taxes, and appoint officers. The united canton occupies the sixth place in the Swiss Confederation.

The surface of Unterwalden is very diversified, and in some places forms scenery of remarkable beauty and sublimity. It is chiefly a pastoral canton, and the pastures are mostly natural. The country abounds with fruit trees, and a little wine is made. The honey is excellent. The soil is generally fertile, producing far up on the mountain sides extensive forests of excellent timber, and lower down plantations of chestnuts and great quantities of apples and pears. The whole district belongs to the chalk formation, in which a great number of remarkable caverns occur.

The canton imports corn, wine, salt, manufactures, and colonial articles, and exports cattle, cheese, butter, timber, and hides. It is not favourably situated for trade, being confined between the Alps and the lake, with no highroad passing through it, and none but mountain passes leading out of it. Each of its two divisions has an hospital and a poorhouse. A dialect of the Swiss-German is the language universally spoken. The Roman Catholic is the religion of the whole canton. The Benedictine monastery of Engelberg, which is more than 3000 feet above the sea, is a foundation of the eleventh century. It has a library of 20,000 volumes, and several valuable MSS., a collection of medals, engravings, and armorial ensigns. A grammar-school is attached to it.

**UPAS-TREE** (*Antiaris toxicaria*) is a tree belonging to the tribe ARTOCARPACEÆ, order UTRICACEÆ, about the properties of which most exaggerated statements were formerly current. It was said to be a large tree, growing in the island of Java, in the midst of a desert caused by its own pestiferous qualities; its exhalations were reported to be so unwholesome, that not only did they cause death to all animals which approached the tree, but even destroyed vegetation for a considerable distance round it; and, finally, the juice which flowed from its stem, when wounded, was said to be the most deadly of poisons. To approach the upas-tree, even for the momentary purpose of wounding its stem and carrying away the juice, was stated to be so dangerous, that none but criminals under sentence of death could be found to undertake the task. The narrative is first found in the work of a certain Foersch,

a surgeon in the service of the Dutch East India Company about 1783. He declared that of 1600 refugees who fled to an encampment within 12 or 14 miles of the tree, only 300 were alive in less than three months. Erasmus Darwin accepted the tale, and gave it credence by inserting it into his "Loves of the Plants."

"On the blasted heath  
Fell Upas sits, the hydra-tree of death."

This story was shown to be false in 1810 by Leschenault. It contains, however, some elements of truth. The upas-tree grows in forests like other trees, and though animals do not avoid it, its milky juice yields a most venomous poison, with which the natives anoint their arrows. Severe effects are also said to be felt by those who have climbed the tree for the purpose of bringing down the branches and flowers. The inner bark is sometimes made into a coarse garment, but unless the fibre be thoroughly cleaned, it excites the most intolerable itching. The story of the valley of death is owing probably to exaggerated reports of the fatal character of some low-lying grounds where was a copious emission of carbonic acid gas; some of the extinct volcanic craters in the island are also said to emit sulphureous vapours in such abundance as to cause the death of a great number of animals.

The upas-tree grows to a height of 100 feet or more, and has a straight trunk and a handsome rounded head. The leaves are oblong or ovate. The flowers are unisexual, but both kinds are found on the same tree. The female flowers are solitary, placed in the axils of the leaves; and beside them are congregated numbers of the minute male flowers. The fruit is an oval purple drupe.

Another upas-tree is the Upas Tjettok or Upas Tietuk (*Strychnos tictu*), from which the Malays prepare a still more deadly poison, causing almost instant death. [See STRYCHNOS.] There is another species of the genus to which the upas-tree belongs, *Antiaris Sacidora*, a native of Malabar, from the inner bark of which sacks are made for holding rice, &c.

**UPHEAVAL OF LAND.** See ELEVATION.

**UPOLU'**, one of the Samoan Islands in the Pacific Ocean, 14° 2' S. lat., 171° 21' W. lon., is visited annually by English and American whalers for the plentiful supply of fruits and vegetables to be obtained there. Cotton and coffee are grown, but cocoa-nut oil is the chief export. The area is about 60 square miles, and the population is estimated at 16,000. It is a British missionary station, and many of the inhabitants are Christians.

**UPPER GREENSAND.** See CRETACEOUS FORMATION.

**UP'PINGHAM**, a town of England, in the county of Rutland, 6 miles south from Oakham, and 83 miles north of London, consists chiefly of one street, tolerably well paved, with an open area in the centre. The chief building is the grammar-school, which was founded in the time of Elizabeth. There is a chapel adjoining the school. The church, which is large, with a lofty spire, contains several interesting portions. Jeremy Taylor was at one time rector. Population, 2519.

**UPSALA** is a town in Sweden situated on the Fyrisa, a navigable stream in the Upsala Lan, 45 miles N.N.W. of Stockholm. The population is 15,675. The town extends over a great area, as there are large gardens to most of the houses. The latter are partly of stone and partly of wood, and generally only two storeys high. The streets are wide and straight, especially those that terminate in the spacious square which occupies the centre of the town. Upsala is the seat of an archbishop, who is the primate of the whole of Sweden. The cathedral, which was erected between 1258 and 1435, and in which the Swedish kings were formerly crowned, is considered the finest Gothic building in Sweden. It contains monuments to many distinguished persons, among others to Gustavus I. and

**Linnaeus.** The square in which the church stands is surrounded by the university buildings, which contain a library of 200,000 volumes and 7000 MSS. (the richest in Sweden), including the "Codex Argenteus," a copy of the Gospels in Mæso-Gothic, as translated by Bishop Ulfilas at the end of the fourth century, a collection of coins, an anatomical theatre, observatory, chemical laboratory, and a very extensive collection of natural objects. There is also an ecclesiastical school, governor's palace, and old and new botanical gardens. The university was established in 1478, and is the chief institution of the kind in Sweden, and is generally attended by about 1450 students. Like those in Scotland and Germany they lodge in the town. Some students are maintained free of expense from endowments left by Gustavus Adolphus. The Society of Sciences, instituted in 1719, has published several volumes of Transactions. Nearly all the inhabitants are more or less dependent on the university. There is steam communication with Stockholm on the river. The town, which was the old capital of Sweden, stands in the midst of a very extensive and fertile plain, and about 6 miles to the south-east are the *mora-stones*, at which the electors met for the purpose of choosing their king when it was an elective kingdom (1140-1520).

*Upsala Gamla*, or *Old Upsala*, a town about 3 miles north of the present Upsala, is, next to Sigtuna, the most ancient residence of the Swedish kings, but is now reduced to a small village. The church has been built out of the ruins of old heathen temples, and its tower is understood to have formed part of the temple of Odin. Numerous antiquities have been found near here, and among the tumuli in the vicinity are the so-called "graves" of Odin, Freya, and Thor.

**UPTON-ON-SEVERN**, a market-town of England, in the county of Worcester, 119 miles N.W. from London by rail, and 7 miles from Worcester, is a neatly-built and thriving place, mostly situated on a cliff near the south-west bank of the Severn, over which there is a bridge, which replaced one destroyed by a flood in 1852. The church is a modern and handsome structure. The town also contains chapels for dissenters, several schools, and a modern market-house, including a town-hall and assembly-room. There are no manufactures, but a good trade is carried on in corn, elder, malt, and coals and other heavy goods, as the river is navigable for barges of 100 tons, and a commodious wharf has been built here. Population, 2485.

**U'RAL**, a river which forms part of the eastern boundary of Europe, rises in the Ural Mountains, near 55° N. lat., at an elevation of 2132 feet above the sea. It first runs south above 200 miles to the fortress of Orskaia, where it turns to the west, in which direction it passes south of the town of Orenburg, and continues to flow about 350 miles to the fortress of Uralsk. Near this place it again turns south, and reaches the Caspian Sea after a total course of about 1000 miles. At Orskaia, where its level is about 550 feet above the sea, the Ural begins to be navigable for large barges. It overflows its banks annually. About 40 miles from its mouth it divides into two channels, of which the eastern preserves the name of Ural, and the western is called Mokroi Backsai. Lower down it again divides into two channels, of which the western is called Ural and the eastern Bukharka. The last-mentioned is the most convenient for vessels, and on its banks stands the fortified town of Guriew. In the upper part of its course the Ural flows through a channel lined with steep and lofty rocks, its lower portion through extensive steppes and saline marshes. The islands forming its delta are covered with salt swamps, and are entirely unfit for cultivation or pasture. The quantity of fish annually taken in the river is very great. They ascend to the fortress of Uralsk, where their course is stopped by a weir. Belugas (*Acipenser huso*) have been taken here weighing

1000 lbs., and yielding 200 lbs. of caviare; and common sturgeons weighing 200 lbs., and yielding 40 lbs. of caviare. In summer the fish are salted, but in winter they are exported in a frozen state.

**U'RAL MOUNTAINS**, a range on the eastern boundary of Europe, separating European Russia from Siberia. Its southern extremity is on the right bank of the river Ural, near 51° N. lat.; the northern terminates in the Arctic Ocean, opposite the island of Nova Zembla, in about 70° N. lat., 60° E. lon. The length of the range is about 1250 miles; near 53° N. lat. its width is about 100 miles, but further north it narrows to less than 50 miles, and between 56° and 60° N. lat. the width is hardly 20 miles. Further north it grows wider, but this portion is but little known. The general elevation of the range is not great, none of the summits rising to more than 5500 feet above the sea, and the highest parts often falling short of 2000 feet. The eastern slope descends rapidly and with steep declivities to the great plains of Asia. On the west the mountains do not immediately border on the great plains of Eastern Europe, but are separated from them by a hilly tract from 20 to 40 miles wide.

The northern portion of the Ural range is bare and naked; the base is granite, the upper stratifications are limestone and quartz, and many erratic blocks are scattered over the surface. The central and southern sections are clothed with timber, chiefly pines, cedars, larches, and other natives of a northern climate; oak and ash are found in the south-western parts. There are many rich valleys and fine pastures, where great numbers of cattle are bred. Numerous rivers, abounding in fish, issue from both sides of the chain, the principal of which are the Sosva, the Isset, the Tobol, the Emba, the Ural, the Belaja, the Kama, and the Petchora. There are seven passes over these mountains; the five that are the most easy to cross are the road from Perm to Ekaterinburg, that to Petropavloskaia, and the roads to Orenburg.

The central part of the Ural Mountains is one of the richest mineral regions in the world. The most important products are iron, copper, gold, silver, platinum, and salt. A variety of other mineral productions are also found, among which are topaz, iridium, malachite, onyx, topaz-emerald, beryl, and agate. Diamonds have been found of small size, but of very pure water. The population of the Ural Mountains is 135,000, nearly all of whom are dependent on the mines.

**U'RAL-ALTA'IC LANGUAGES** are those better described as Turanian. See **TURANIAN RACE AND LANGUAGES**.

**U'RALITE** (so called from its occurrence in the Ural Mountains) is one of the PYROXENE group of minerals, having the outward form of AUGITE, but the cleavage planes of HORNBLÉNDÉ. It is thus an intermediate form between the two latter well-known minerals.

**URAMIL'IC** or **DIALURAM'IC ACID** is obtained from dialuramide by the action of sulphuric acid. It crystallizes in silky needles, which are soluble in water. The formula is  $C_{12}H_{11}N_3O_7$ . It forms crystalline salts with the alkalis, and insoluble precipitates with calcium, barium, and silver salts. When boiled with dilute sulphuric acid it is converted into dialuric acid.

**URA'NIA** (Gr. *Ourania*), the Muse of Astronomy, one of the Nine Muses of the Greek mythology. She was, like the other muses, a daughter of Zeus by Melpomene. The emblems of Urania are a globe of stars, and a small rod to point with.

**URA'NIA.** See **TRAVELLER'S TREE**.

**URA'NIUM**, a rare metal, discovered by Klaproth in 1789. It is found in several minerals, but the principal source is pitchblende, which is an impure oxide; it occurs also in Liebigit as a carbonate, in Johannite as a sulphate, in Uranite as a phosphate, and also in Samarskite, Ferguson-

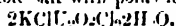
ite, pyrochlore, and euxenite. It is obtained from pitchblende by digesting it with hydrochloric acid to dissolve out the other metals; the residue is roasted with charcoal; the process is repeated, and the residue dissolved in nitric acid, which, on evaporation, yields crystals of impure uranic nitrate; and from this the oxide is obtained by ignition with charcoal. The pure metal is best prepared by fusing the protochloride with sodium. The sodium chloride is washed out by water, and the uranium obtained as a black powder, which may be fused at a high temperature into globules. It is a hard, white metal resembling steel, and having a specific gravity of 18.4. It is malleable and permanent, but it tarnishes on exposure to the air, and becomes yellow. At a red heat it burns with splendour, forming a black oxide. It combines directly with chlorine with incandescence, and also with sulphur. It dissolves in dilute hydrochloric acid with evolution of hydrogen, forming solutions of a green colour. The symbol is U; the atomic weight is 120.

Uranium forms four oxides, uranous-oxide ( $\text{UO}$ ), uranic oxide ( $\text{U}_2\text{O}_3$ ), uranoso-uranic oxide ( $\text{U}_3\text{O}_4$ ), and a black oxide ( $\text{U}_4\text{O}_{10}$ ). Uranous oxide, which was at first mistaken for the metal, is obtained from uranoso-uranic oxide by heating it to redness in a current of hydrogen; it is a gray metallic powder, insoluble in dilute acids. From solution it is precipitated as a brown hydrate by caustic alkalis.

Uranoso-uranic oxide occurs native as pitchblende; it is a dark-green powder, used for producing a permanent black glaze on porcelain. It is soluble only in strong acids, and from the solutions uranoso-uranic hydrate is precipitated by ammonia as a green powder, which is soluble in dilute acids; the solution contains uranous and uranic salts. By the ignition of this oxide the black oxide is obtained; this is the substance formed in glazing porcelain. Uranic oxide is obtained by igniting uranic nitrate, as a yellow powder. It forms a hydrate, having the formula  $\text{U}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ , which, on gently heating, gives off water and forms a monohydrate ( $\text{U}_2\text{O}_3 \cdot \text{H}_2\text{O}$ ), a yellow powder. All these uranic oxides dissolve in acids, forming uranic salts. Uranic oxide also acts as an acid, and forms salts with bases, called uranates, of which the general formula is  $\text{M}_2\text{O} \cdot 2\text{U}_2\text{O}_3$ . These are insoluble yellow salts, generally obtained by precipitation by a caustic alkali, or in the metals by a metallic salt and ammonia. The ammonia salt yields pure uranoso-uranic oxide, and therefore forms a basis for the preparation of all the pure uranium compounds.

The acid uranate of sodium ( $\text{Na}_2\text{O} \cdot 3\text{U}_2\text{O}_3$ ) is obtained in bronze scales, resembling mosaic gold. The ordinary uranate of sodium ( $\text{Na}_2\text{O} \cdot 2\text{U}_2\text{O}_3$ ) is much employed as a yellow colour for glazing porcelain, and also for making the well-known yellowish-green glass peculiar to uranium, and remarkable for its fluorescence. It is obtained by roasting pitchblende with lime, and dissolving out the uranic oxide with dilute sulphuric acid, from which the sodium uranate is precipitated as a hydrate by caustic soda. It is the most important commercial application of uranium.

There are three chlorides of uranium: the subchloride ( $\text{U}_2\text{Cl}_3$ ), the dichloride or uranous chloride ( $\text{UCl}_2$ ), and the uranic oxychloride ( $\text{H}_2\text{O} \cdot \text{U}_2\text{Cl}_2$ ). The subchloride is a dark-brown substance, soluble in water, forming a purple solution, which quickly decomposes with evolution of hydrogen into uranous chloride. Uranous chloride is formed when uranium is burned in chlorine; it is a dark green deliquescent crystalline substance, soluble in water, and forming a dark green solution. It volatilizes at a red heat. Uranic oxychloride is an orange yellow fusible crystal, which forms double salts with the alkaline chlorides. The formula of the double salt with potassium is

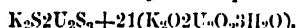


There are two bromides of uranium: uranous bromide ( $\text{UBr}_2$ ), and uranic oxybromide ( $\text{U}_2\text{O}_3 \cdot \text{Br}_2$ ); both are yellow deliquescent crystalline salts, soluble in water.

Uranous iodide ( $\text{UI}_2$ ) is a black crystalline substance insoluble in water.

There are two fluorides of uranium: uranous fluoride ( $\text{UF}_2$ ), a green insoluble powder, and uranic oxyfluoride ( $\text{U}_2\text{O}_3 \cdot \text{F}_2$ ), a white substance soluble in water and alcohol. Both these bodies form double fluorides with the alkalis.

There are three sulphides of uranium: uranous sulphide ( $\text{US}$ ), a black amorphous powder, uranous oxy-sulphide ( $\text{U}_2\text{S}_3\text{O}$ ), and uranic sulphide; the latter is not known in the separate state, but it forms a blood-red compound with ammonium sulphide, which, when treated with potash, yields a red substance, having the complex formula



It is called uranium red. Similar red compounds are formed with soda, baryta, and strontia. Uranium can be detected by the clear yellow glass formed with borax before the blowpipe, and which becomes greenish on cooling. Uranous salts are green; uranic salts are yellow and bitter. It is usually estimated as uranoso-uranic oxide, which is obtained by igniting the hydrated uranic oxide precipitated from its solution by ammonia. Uranium compounds are used in enamel painting and for staining glass, uranous oxide giving a fine black colour, and uranic oxide a delicate greenish-yellow highly fluorescent glass. Uranium salts are also used in photography.

**U'RANUS**, a primal god in the Greek mythology. See **OURANOS**, of which Uranus is the Latin corruption.

**URANUS**. On 13th March, 1781, Sir William Herschel, then Mr. William Herschel of Bath, was examining the stars in the constellation Gemini with a reflecting telescope made by his own hands. The magnifying power being considerable, Herschel perceived an object which was not a luminous point, as ordinary stars are, but which had a disc of appreciable dimensions. By continued observation of the same object he noticed that it also differed from the stars in another very important respect, for while the stars remain fixed this new object was in motion. At first the discovery was communicated to the Royal Society as being that of a new comet. But when attempts were made to accommodate the elements of a parabolic orbit with the observations, it became manifest that the object could not be a comet. It was then found that all the observations could be well represented by a circular orbit with a radius nineteen times that of the earth's orbit. The object was therefore a planet, moving at double the distance of Saturn. Herschel proposed to call the planet the Georgium Sidus, in honour of his royal patron, but ultimately the name Uranus was suggested by Bode, on the ground that the most distant body of the system might be appropriately named after the oldest of the gods.

The mean distance of Uranus from the sun is about 1,770,000,000 miles, and the period of one revolution is eighty-four years. It is as bright as a star of the sixth magnitude, and can be seen with the naked eye by one who knows exactly where to look for it. It was in opposition on 11th February, 1877, and the time of opposition for the next twenty or thirty years will be found by adding four and a half days to the date just given for each year subsequent to 1877. To recognize the disc of the planet clearly, a power not less than 200 must be used. With a powerful instrument the surface of the planet is seen to be of a greenish hue. No markings have ever been seen on the disc, but from dynamical reasons it can be regarded as certain that the planet rotates in the same plane as that in which the few satellites revolve around it.

Uranus is attended by four satellites, the observation of which is only feasible with instruments of the greatest power and perfection. It is extremely remarkable that the plane in which these satellites revolve is inclined at very nearly a right angle to the plane of the orbit of the planet. The orbits are all circular, and lie in the same plane. The

periodic time of the innermost satellite, Ariel, is 2-520383 days, and of the outermost 13-463269 days. By observations of the satellites the mass of Uranus has been found to be  $1 \div 22600$  of the mass of the sun, while its diameter is about 31,700 miles. Uranus is thus the third largest planet of those which revolve around the sun.

We refer to the article NEPTUNE for an account of the very memorable researches on the perturbations of Uranus, which led to the discovery of the planet Neptune.

**URARI.** See OURARI.

**UR'BAN**, of this name there were eight popes:—

**URBAN I., SAINT**, a Roman by birth, was chosen bishop of Rome in 224 as successor to Calixtus. It is said that he suffered martyrdom under the Emperor Alexander Severus during a persecution which was commenced without the emperor's command. The introduction of silver vessels into churches is attributed to him. He died in 231.

**URBAN II., SAINT** (*Otho of Chatillon*), was born at Chatillon, studied at Rheims, was prior of Clugny, and made bishop of Ostia by Gregory VII. On the death of Victor III. he was chosen pope, 1087, although the anti-pope, Clement III. (Ginbert), was still living, and had a considerable party at Rome. In his reign began the crusades, which he strenuously encouraged, and for which he made his splendidly successful appeal at the General Council of Clement (1096). At a council which was held at Bari in 1097 he attempted a union of the Greek and Roman churches, but without success. In his zeal to strengthen the church's supremacy, and supported by the great Guelfic Countess Matilda of Tuscany, he opposed Henry IV. of Germany, whom he frequently excommunicated. He even stirred up Henry's son, Conrad, to rebel against his father, and the undutiful prince took an oath of allegiance to Urban at Crenoma, 1095, in return for which he was promised the imperial throne. The Pope was also involved in a dispute with Philip I. of France, whom he excommunicated in 1094 because he had divorced his wife Bertha, 1092, and married another. The anti-pope, Clement III., was another opponent whom he repeatedly excommunicated together with his adherents in several synods, and for the last time at a Roman synod in 1099. Urban died in the same year. He was a powerful supporter of the hierarchy, freeing the popes from the necessity of obtaining imperial sanction to their election, renewing the laws enjoining celibacy, and forbidding bishops and priests to take the oath of allegiance to princes, or to receive offices from the hands of laymen.

**URBAN III. (Lamberto or Umberto Crivelli)** was a native of Milan, of which place he was made bishop by Pope Lucius III., and a cardinal in 1182. In 1185 he was chosen pope. Finding it impossible to live peaceably at Rome, he removed his court to Vienna. With Frederick I., emperor of Germany, he had many disputes, but he was always worsted by the Germans adhering to their sovereign. He died at Ferrara in 1187, through grief at the loss of Jerusalem, which was taken by the Saracens.

**URBAN IV. (Jacques Pantaléon)**, son of a shoemaker at Troyes, was first a canon in his native place, then bishop of Laon, and subsequently patriarch of Jerusalem. In 1261 he was chosen pope at Viterbo. Manfred was then King of Sicily and Apulia, and the head of the Ghibellines. Against him Urban preached a crusade; but when he found that the king was marching against him in alliance with his own rebellious subjects at Rome, he summoned to his aid Charles of Anjou and fled to Orvieto. Charles accepted the offer made to him, by which he was to receive the crown of Sicily and Apulia as a fief of the Roman see. But the Pope died at Perugia in 1261, as Charles was preparing to attack Manfred, and the latter conquered almost all the territory of the church.

**URBAN V. (Guillaume de Grimoard)**, a native of France, was a Benedictine monk, and taught in that

capacity at Montpellier till, although not a cardinal, he was elected pope at Avignon during the "exile" in 1362. He was the first on the papal throne who consecrated a golden rose, which he sent as a present to Queen Joanna of Naples, the first to wear the tiara or triple crown, and the last pope but one who resided at Avignon. Having surmounted the obstacles which the King of France and the cardinals put in the way of his going to Rome, whither the earnest exhortations of Petrarch called him to return, he made his entry into the metropolis amid great demonstrations of joy in 1367. Urban returned to Avignon, Rome being still in a very disturbed state, and died there in 1371. He was a humane, just, and generous man, who distinguished himself by befriending the people and punishing their oppressors. He was also a decided enemy to nepotism; a patron of learning, supporting 1000 students annually at his own expense; a reformer of abuses among the clergy, and inflexibly just in his proceedings.

**URBAN VI. (Bartolommeo Perignano)**, the pope of the great schism, was born at Naples in 1318, and became archbishop of Bari. In 1378 he was elected pope, although (or perhaps because) he was not a cardinal, on promising the cardinals that he would reside at Rome, not at Avignon. Immediately after his elevation he conducted himself with so much haughtiness and severity towards the cardinals, that the twelve French cardinals left Rome and went to Anagni, where they excommunicated him, and chose Robert of Geneva pope as "Clement VII." The latter at once took up his residence at Avignon, and obtained the approbation of several European princes, but most stood firm by Urban, among them Charles IV., emperor of Germany. Urban's haughtiness, however, alienated some of his friends, among others Queen Joanna of Naples, who had supported him with an army. He thereupon crowned Charles of Durazzo king of Sicily, but failed to maintain him by the force of arms. After Charles had been settled on the throne of Naples he was not very willing to fulfil all his promises, so that disputes arose between him and Urban. But though the two were presently reconciled, they did not continue friendly. Urban accused Charles of being privy to a conspiracy entered into by the cardinals against him, excommunicated the king, and caused six cardinals to be thrown into prison and tortured. Besieged by Charles in Nocera, he with difficulty escaped, and went to the coast of Pastum, where he embarked in a Genoese squadron, dragging the half-dead cardinals with him. From Genoa, where five of the cardinals either died or were murdered, he went to Lucca in 1386. Availing himself of Charles' absence in Hungary, he attempted to enter Naples, but was abandoned by his troops, whom he was unable to pay. He was therefore compelled to return to Rome in 1388, where he died in the following year, of poison as some say, or as others have it, of an injury caused by a fall from his mule. His last act was to proclaim a jubilee for 1400, which he was never to see. Urban VI. was a disgrace to the papal chair; a proud, cruel, violent, unjust man. Many cardinals held him to be mad.

**URBAN VII. (John Baptista Castagna)** was professor of civil and canon law and archbishop of Rossano. After being employed by several popes on different errands in Germany and Spain, he became a cardinal in 1583. In 1590 he was elected pope. He died thirteen days after his nomination, without having been consecrated, and was succeeded by Gregory XIV.

**URBAN VIII. (Maffeo Barberini)** was born at Florence in 1568. After studying at Rome and Bologna he was promoted to several offices of trust under Sixtus V., Gregory XIV., and Clement VIII. In 1601 he was elected archbishop of Nazareth, and went as ambassador to Paris, where he laboured much for the restoration of the Jesuits. In 1605 he became cardinal presbyter, in 1608 archbishop of Spoleto, and in 1623 he was elevated

to the see of St. Peter. In 1631 the duchy of Urbino was added to the church's territory. Urban gave the title of "eminence" to the cardinals, renewed the bull in *cana Domini*, improved the "Breviarium Romanum" (1632), erected the Propaganda College (1627), enriched the Vatican library, condemned Galileo's astronomical system, and the "Augustinus" of the famous Janssen, &c. He died in 1644, after reigning twenty-one years. He was a learned and able man, a patron of the arts and sciences, and a poet. Yet he abandoned the management of civil affairs too much to his nephews, who hated Spain and made use of France as a check to its pride. He showed an excessive concern for the interests of his relations, which may be called the only public failing in his character, for he was, on the whole, a mild, tolerant, and friendly man.

**URBINO** (ancient *Urbilum Hortense*), a city of Central Italy, in the Marche, capital of the province of Pesaro ed Urbino, on an isolated hill in the midst of bleak mountains, 20 miles S.W. of Pesaro. The population of the town proper is about 6000, and of the whole commune 15,000. It is the seat of an archbishop. The old walls impart to the city a feudal aspect. It is celebrated as the birthplace of Raffaele, and for many historical, artistic, and literary associations. The cathedral and other churches contain remarkable paintings. The finest public building, still unrivalled in the *cinquecento* style, is the ducal palace, built by Frederick of Montefeltro, from the designs of Lauranna. The free university dates from 1671. The city also possesses a lyceum, a gymnasium, a technological institute, and an academy of science. In the sixteenth century it had celebrated manufactures of earthenware, and in the eighteenth of fire-arms, needles, and pins; the latter are still extensive.

Urbino was of some importance under the Romans. In the sixth century it was taken by Belisarius. Pope Sixtus IV., in 1474, bestowed the title of duke upon the counts of Montefeltro, the local rulers. Francesco Maria della Rovere, a nephew of Pope Julius II., succeeded to the duchy in 1508 as the son-in-law of the last duke of the Montefeltro line. Under this dynasty the court of Urbino rivalled that of Ferrara in magnificence and in the patronage of art and literature; its most illustrious associations were with Raffaele and Tasso. In 1631, on the extinction of the house of Rovere, the duchy, then comprising hundreds of palaces and many towns, became one of the immediate possessions of the Papal States; and in 1860 it was incorporated with the dominions of Victor Emmanuel. The anniversary of Raffaele's birth and death occurring on the same day, was solemnly celebrated at Urbino, 6th April, 1873, and the house in which he was born was purchased in 1874 by the Raffaele Academy, and fitted up as a museum.

**URCEOLA** is a genus of plants of the order Apocynaceæ. It contains four species, confined to the Malayan region. From *Urceola elastica* is obtained a kind of caoutchouc or india-rubber, a milky juice which oozes out on incisions being made in the soft thick bark, and is coagulated with salt-water. This caoutchouc is inferior to the American kinds. See INDIA-RUBBER.

*Urceola elastica* is a large climbing shrub or tree, with sharp, ovate, opposite leaves, and thick terminal clusters of small green flowers, which produce double fruits, each about the size of an orange. These have a rough leathery skin, and contain numerous seeds, embedded in a pulp, which is much relished by the natives and European residents.

**URDU'** is another name for the language usually called HINDUSTANI.

**URE, ANDREW, M.D.**, an eminent chemist and successful scientific writer, was born at Glasgow in 1778. He completed his education at the Glasgow University, where he received the degree of M.D. in 1801. In the

following year he was appointed professor of natural philosophy and chemistry in Anderson's College. Having laboured very zealously to secure the establishment of an observatory at Glasgow, he was attached to it, in 1809, as its first astronomer. His first publication was a "Systematic Table of the Materia Medica," in 1813, and his second, a valuable paper, entitled "Experimental Researches on the Leading Doctrines of Caloric," printed in the *Philosophical Transactions of the Royal Society*. In 1821 appeared his elaborate "Dictionary of Chemistry;" in 1822, "The Ultimate Analysis of Animal and Vegetable Substances;" and in 1829, a "System of Geology," in which he supported the now exploded hypothesis of a universal deluge. Having removed to the metropolis, he received, in 1834, the appointment of analytical chemist to the Board of Customs, in which position he acquired and maintained a deservedly high reputation. He displayed great ingenuity in devising and improving volumetrical methods of analysis, which proved of much value for commercial testing. In 1835 Dr. Ure published his "Philosophy of Manufactures;" in 1836, his "Cotton Manufactures of Great Britain;" and in 1839, his most important work, which is still held in general estimation, the "Dictionary of Arts and Manufactures." A revised edition was issued in 1853, and an enlarged one in 1860, three years after its author's death, which took place in London in 1857. Another edition of his work was published in 1875.

**UREA** is a substance found in the urine of all mammiferous animals, more particularly those that feed on flesh; it is also found to a less extent in the urine of birds and reptiles. It occurs in the human body also, in the blood, the perspiration, and especially in the vitreous humour of the eye, of which it is an essential constituent, forming about 30 per cent. of the solid substance. It is the final organic product formed by the oxidation of the nitrogenous issues. It may be obtained from human urine by evaporating it to a small bulk and adding nitric acid; the nitrate of urea then crystallizes out in large crystals, or it may be precipitated as oxalate by oxalic acid, and the salt decomposed by chalk, which furnishes insoluble calcium oxalate, the urea being left in solution. It may be obtained pure by repeated crystallization from alcohol. It may also be prepared artificially from cyanate of ammonium, with which and with carbamide it is isomeric. The formula is  $\text{COH}_2\text{N}_2$ . It crystallizes in prisms, which melt at  $120^\circ \text{C}$ . ( $248^\circ \text{Fahr.}$ ), and decompose at a higher temperature. It is very soluble in water and alcohol, but insoluble in ether. When boiled with potash it is decomposed into carbonic acid and ammonia.

It forms salts with acids, of which the nitrate is the most characteristic. It crystallizes in hexagonal plates, having the formula  $\text{COH}_2\text{N}_2\text{HNO}_3$ . It is soluble in water and alcohol. The oxalate ( $2\text{COH}_2\text{N}_2\text{C}_2\text{O}_4\text{H}_2$ ) crystallizes in tufts of fine plates, and is soluble in hot water.

Urea also combines with some metallic oxides and with salts, and forms a number of derivatives known as compound ureas. It is often important in certain diseases to estimate the amount of urea in human urine, and many methods have been suggested. It is easily detected in animal fluids by precipitating with nitric acid. The peculiar character of the crystals of nitrate of urea can be at once distinguished under the microscope. Liebig's volumetric method of estimation is easy of execution, and depends on its being precipitated by mercuric nitrate. About a half of the solid matter in human urine is urea, but the proportion varies considerably; about  $1\frac{1}{2}$  per cent. is normal to healthy urine. Sometimes the addition of nitric acid will give crystals of the nitrate without concentration; the urine then contains an excess of urea; that means that it is overloaded with products of oxidation of nitrogenous matter, and indicates disease.

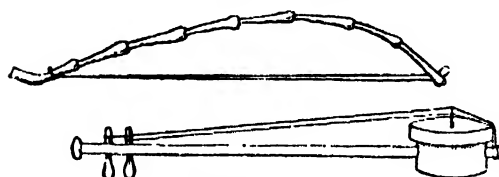


**UREDIN'Æ** is a group of minute FUNGI, parasitic on living plants. It belongs to the order Hypodermiæ. These fungi consist of hyphæ woven into definite receptacles, which at first are situated beneath the surface of the affected part, but at last burst out. The reproductive organs consist of three kinds of spores arranged so as to form a cycle of generations parasitic on different plants. The best known species is *Æcidium BERBERIDIS*, which forms the "mildew" of wheat.

**URETH'EA**, in anatomy, the membranous tube or canal by which the urine is discharged from the bladder. It is liable to inflammatory affections, of which the best known are gonorrhœa and stricture. The tube which conveys the urine from the kidney to the bladder is the ureter.

**URGIN'EA**. See SQUILL.

**UR-HEEN'**, a coarse native Chinese fiddle, which, however, may in its ultimate sources be of Indian origin. It has only two strings, which are stretched over a body of wood, hollowed out and covered with the skin of a serpent.



Chinese Ur-heen.

The strings are of silk, the bow of cane and horse-hair. The ur-heen is about 2 feet long. The hairs of the bow pass between the strings, and as these are very near each other, it is extremely difficult to avoid playing both at once. The strings are at the interval of a Fifth.

**URI**, one of the Swiss forest cantons, is bounded N. by Schwyz, W. by Unterwalden, Bern, and the Valais, S. by the group of the St. Gotthard, which separates it from the canton of Ticino, and E. by the Grisons and Glarus. The area is 415 square miles, and the population in 1880 was 23,694, all of whom were Roman Catholics. The canton consists chiefly of a valley about 30 miles long, drained by the Reuss, which rises in Mount St. Gotthard, and flows northwards into the Lake of Lucerne. The southern branch of this lake is called the Bay of Uri. A highroad, connecting Uri with Ticino, and forming part of the great route between Switzerland and Italy over the St. Gotthard, passes through the valley; and a tunnel pierced near the St. Gotthard Pass, opened in 1882, gives railway communication through the mountains. The canton is so hemmed in by mountains that these, and Lake Lucerne, are the only practicable outlets. Several minor valleys branch out right and left from that of the Reuss. There is a tract of open country in the lower part of the valley of the Reuss, near the shore of the Lake of Lucerne. Uri is essentially a pastoral district; horned cattle, sheep, and goats are numerous, and it is upon their produce that the inhabitants almost entirely depend. In the lower grounds the soil is fertile, producing abundance of fruits, vegetables, &c.

The constitution of Uri is strictly democratic. The legislative power is vested in the General Assembly, composed of all the male population above twenty years of age, who meet in a meadow every year on the first Sunday in May, to choose the cantonal council. To the latter is confided the direct executive power. The communes are too poor to support schools all the year round, and education is very backward. Uri is supposed to have derived its name from *urus*, "the wild bull," which formerly inhabited the valley in great numbers. This was one of the three cantons which revolted from the German Empire in 1307, and formed the nucleus of the Swiss Confedera-

tion, in which it now holds the fourth place. It was the chief theatre of the war between France and Austria in 1799-1800. The principal town is ALTKÖNIG.

**URIC ACID** or **LITHIC ACID** was discovered by Scheele in 1776. It is an important constituent of the human body, and arises from oxidation of animal tissue. It is present in the spleen, liver, lungs, and brain, and in the blood and urine. It is also found in the urine of carnivorous animals, and as urate of ammonia it is the principal constituent of the urine of reptiles, insects, and birds. In certain diseases, especially in gout, it accumulates in the blood and urine, and is found in all parts of the body, and is sometimes deposited as sodium urate in the distressing concretions known as chalk stones; it is also sometimes deposited in the bladder in the form of gravel and calculus, and as a sediment in the urine. It is best obtained from the excrement of serpents, which is ammonium urate almost pure. It is boiled with potash solution and the uric acid precipitated by hydrochloric acid. It may also be obtained from guano. The precipitate is white, crystalline, and anhydrous. The formula is  $C_5H_4N_4O_3$ . When slowly deposited it is obtained in large hydrated crystals, having the formula  $C_5H_4N_4O_3 \cdot 2H_2O$ . It is insoluble in water, and also in alcohol and ether. It is soluble in strong sulphuric acid, and is precipitated again from the solution on the addition of water. When heated it decomposes, giving off hydrocyanic acid, cyanuric acid, ammonium cyanate, urea, and ammonium carbonate. By general oxidation it produces alloxan, but with peroxide of lead the product is allantoin. In addition to these substances an immense number of other bodies are obtained from it by varied oxidation.

Uric acid is dibasic, and combines with bases to form two series of well-marked crystalline salts, acid and neutral, which are only slightly soluble in water. The acid urate of ammonium,  $C_5H_4N_4O_3(NH_4)O_3$ , is the salt found in the excrements of the serpents. The acid potassium salt has the formula  $C_5H_4N_4O_3K$ ; that of the neutral salt is  $C_5H_4N_4O_3K_2$ . The urate of lithium ( $C_5H_4N_4O_3Li$ ) is the most soluble of the urates, hence lithia water is constantly prescribed as a beverage for gouty patients. There are two uric ethers or ethyluric acids: diethyluric acid,  $C_5H_4N_4(C_2H_5)_2O_3$ , and triethyluric acid,  $C_5H_4N_4(C_2H_5)_3O_3$ ; both are crystalline bodies, soluble in hot water, alcohol, and ether.

Uric acid is easily detected in urine by its insolubility in water and hydrochloric acid, and by the appearance of the minute crystals under the microscope, which often have the shape of dumb-bells. When moistened with nitric acid, and evaporated, the residue gives a fine violet colour with ammonia, known as murexide. It is estimated by precipitation with hydrochloric acid.

**URIM** and **THUMMIM** (Heb., light and perfection), the name of a mysterious kind of ornament worn in the habit of the Jewish high-priest, which was consulted as an oracle on occasions of importance. Various are the conjectures upon this subject; and the Scriptures do not appear anywhere to elucidate the mystery. We learn from Jewish tradition that when the Urim and Thummim was to be consulted the high-priest put on his robes, and going into the holy place stood before the curtain that separated the sanctuary from the sanctuary, then turning his face directly towards the ark and the mercy-seat over it, upon which the divine presence rested, he proposed what he wanted to be resolved about; and directly behind him, at some distance, without the holy place, stood the person at whose command or entreaty God was consulted, and there, with all humility and devotion, expected the answer. The ceremony was probably of Egyptian origin, for we are informed by Diodorus Siculus that there was a similar form in use among the Egyptians, whose principal minister of religion and justice wore a collar of precious stones

about his neck, which was called *Alétheia* or Truth. According to the testimony of Josephus, the oracular ceremony of the Urin and Thummin ceased about 112 n.c., but we do not find any instance recorded of its use during the time of the first temple, and we know from Ezra ii. 63 that it was unknown during the second. There is also a rabbinical tradition to the effect that Jehovah spoke to his people during the time of the tabernacle by the Urin and Thummin, during the first temple by the prophets, and during the second by the Bath-Col. In the imposture of Joseph Smith, which forms the basis of Mormonism, the Urin and Thummin were declared to be a kind of spectacles or glasses, by aid of which the "saint" was able at once to decipher and translate the golden plates on which, in an unknown tongue, was written the Book of Mormon.

**URINE** (Gr. *ouron*, water) is a fluid secreted from the blood by the kidneys. Every excretory organ performs some special office: the lungs clear the system of its excess of carbon, and the kidneys purify it of azote and saline matter. Besides secreting a peculiar azotic substance, the kidneys have an oxygenating power, for the sulphur, phosphorus, calcium, &c., of the blood are changed to acids and oxides, or earths, by the glandular energy of these organs.

The urine of a healthy person when recently voided is acid, transparent, usually of a pale amber or straw colour, a brackish, bitterish taste, peculiar odour, and of a specific gravity varying from 1.015 to 1.030. On standing for a short time a flocculent cloud of mucus forms on it.

The character of the urine is affected by the seasons. In winter the kidneys are excited to greater activity than in summer. In cold weather the perspiration is more or less suppressed; and were it not that the action of the kidneys is increased we should be liable to plethoras, or repletions of the most dangerous nature. Hence it happens that when the perspiration is abundant the urine is scanty and high-coloured, and contains a strong impregnation of saline ingredients. When the perspiration is checked by any cause the urine is copious, limpid, and its proper salts more diluted.

Healthy urine is always acid; it becomes ammoniacal and alkaline only by a prolonged exposure to the atmosphere, for it remains perfectly unchanged if kept in a vessel well stopped. It is probable the decomposition is due to atmospheric germs.

The following table shows the constituents which enter into the composition of 1000 parts of healthy human urine:—

Water. . . . .	967
Solids, . . . . .	33
	<hr/>
	1000
	<hr/>
<i>Solids</i> —	
Urea, . . . . .	14.230
Other nitrogenous crystalline bodies, .	10.635
Viz.:—Uric acid, kreatin, xanthin, hippuric acid, leucin, tyrosin, taurin, cystin, &c., with mucus and pigment.	
Salts, . . . . .	8.135
Viz.:—Sulphates, phosphates, and chlorides of sodium and potassium, with phosphates of magnesium and calcium, together with occasional organic lactates, hippurates, acetates, and formates.	
Sugar, . . . . .	a trace.
	<hr/>
	33.000
	<hr/>

In addition to these matters, which constantly exist in healthy urine, the fluid occasionally contains a variety of other substances, as bile, albumen, fibrin, fat, blood, salts taken as medicine, &c.

In health the quantity passed in twenty-four hours is subject to variation from the temperature, diet, and exercise of the individual, as well as other circumstances, and it is therefore impossible to fix a standard applicable to every case. It increases after meals, and diminishes greatly during sleep. If we consider that the quantity varies in this country from 40 ounces in the summer to 60 ounces in the winter, we should probably be very near the truth as regards a person in good health, and who does not drink more than nature requires. The average of a large number of experiments gave 52½ fluid ounces per day.

Some of the more important diseases of the urinary organs will be found described under the headings of BRIGHT'S DISEASE, CALCULUS, GRAVEL, and DIABETES. Incontinence of urine, involving the unconscious passing of water during sleep, is a common affection of childhood, and one that often causes a good deal of annoyance. It is more common among boys than girls, and it appears to arise, not from the inability of the bladder to retain the water, but from its undue excitability or readiness to contract. In the treatment of this affection attention must be paid to the general health of the patient, and examination made for the presence of intestinal worms, or the existence of any serious disease of the bladder or urinary organs. The drug most efficacious in affording relief in such cases is belladonna, and in the majority of cases, when it is cautiously administered for a few weeks, the annoyance disappears, and does not return. It is best to begin with small doses of the medicine, and to increase them during the second and third weeks of treatment, and for a week or two subsequently, the dose being gradually diminished after its effect has been produced, medical supervision in all cases being absolutely necessary. Local measures consist in the avoidance of suppers, and the limitation of the amount of fluid taken during the evening; in attention to the calls of nature before sleep, and arrangements for arousing the patient once or twice during the night for the same purpose; the use of light and moderately warm bed-clothing, and the use of a mattress instead of a feather bed. In mild cases local measures of the kind indicated will often ward off the trouble without the use of medicine. Where incontinence of urine occurs in elderly people it generally arises from the inability of the bladder to empty itself, from which follows retention, irritability, and the desire for frequent micturition, and in such cases the administration of medicinal agents must generally be associated with the use of the catheter. Where there is any prolonged inability to pass water, surgical aid should be sought without delay, or serious and even fatal results may occur.

**URNS**, among the Greeks and Romans, were round-shaped vases, chiefly used for preserving the ashes and remains of deceased relatives or friends after they had been burned upon the funeral pile. They were chiefly made of a bluish-gray, red, or blue colour, though sometimes, for persons of high condition, they were in chased gold, silver, or brass. The Hamilton collection of cinerary urns, in the British Museum, presents some admirable specimens illustrative of their form and composition.

**URODELA** is an order of Amphibia, distinguished by the elongated body ending in a tail and by the presence of limbs. The body is long and rounded, covered with a soft naked skin, which is sometimes warty, and is sometimes raised on the back into a kind of fin. The limbs are small, the hinder pair remote from the anterior, and sometimes wanting. All the species are more or less aquatic, though some move freely on land. Respiration is by means of branchiæ or gills in early life; in some the gills persist throughout life (*perennibranchiate*), while in



others they disappear at maturity (*caducibranchiate*). Even in the former lungs are always present in the adult. The ribs are rudimentary. The teeth are generally numerous, small, curved, and situated in the jaws and on the palate. The skull is never completely ossified. There is a short tongue, fixed below, and free at the edge. Glands similar to those forming the lateral line in fishes are sometimes present.

The order Urodela is divided into two suborders, Salamandrina (*SALAMANDERS*) and Ichthyodea. The Salamanders have neither gills nor gill-clefts in maturity, and have the vertebra convex in front and concave behind (*opisthocelous*). In this group are included two families, of which the first, Salamandridæ, contains the true Salamanders (*Salamandra*, Plate I. fig. 1), and the NEWTS (*Triton*, fig. 2.) The second family, Amblystomidæ, is chiefly remarkable as containing the AXOLOTL (Plate II. fig. 6), which has been found to be the larval form of *Amblystoma mexicanus*. The suborder Ichthyodea forms a link between the Amphibia and the fishes. The body is long, and the limbs are relatively small and weak, the hinder pair being often absent. The gills are sometimes persistent, and in others the gill-clefts remain after the gills have disappeared. The vertebra, like those of fishes, are biconcave (*amphicelous*). Those in which the gill-clefts persist, but not the gills, form the family Amphimidae, containing the genera *Amphinma*, *Menopoma* (HELLBENDER, Plate I. fig. 3), and *Cryptobranchus*. Those with persisting gills and gill-clefts form the group Perennibranchiata, which contains two families, Sirenidae (SIREN, Plate II. fig. 4) and Proteidae, with the genera *PROTEUS* (fig. 5) and *MENOBANCHUS*.

**UROXANIC ACID**, an acid obtained from uric acid by boiling it with potash. It crystallizes in colourless tetrahedrons, which are slightly soluble in water, but insoluble in alcohol. When the solution is boiled it decomposes, carbonic acid being evolved. The formula is  $C_8H_4N_4O_6$ . When heated steadily at  $130^\circ C.$  ( $266^\circ$  Fahr.) it is converted into uroxanic anhydride ( $C_8H_4N_4O_5$ ), which is isomeric with ammonium dialurate. Uroxanic acid is dibasic, and forms a number of salts having the general formula  $C_8H_3N_4O_5X$ ; these are mostly soluble in water and insoluble in alcohol. The potassium salt crystallizes in shining plates, having the formula  $C_8H_3N_4K_2O_5 \cdot 3H_2O$ .

**URQUHART, DAVID**, politician and author, was born in Cromarty in 1805. He accompanied Lord Cochrane to Greece in 1827, and there formed his first practical acquaintance with the Eastern question. One of the earlier of his more notable works on the subject was his "Turkey and its Resources" (1833) in which he expounded his favourite thesis that the Turkish Empire had in it the elements of great national and social strength. Further and extensive travel in the East was undertaken by him, with the view of discovering and unmasking what he considered to be the aggressive designs of Russia. In 1835 he was appointed by Lord Palmerston secretary of embassy at Constantinople, and in the following year he commenced the publication of the *Portfolio*, devoted to the publication of secret state-papers chiefly bearing on the Eastern question (first series, 1836-37; second, 1843-45). Differences arose between himself and his chief, and he ceased to be secretary of embassy after a brief period, when he returned to England, and began his long and violent crusade against Lord Palmerston and Lord Palmerston's policy in Europe and Asia, in the West and the East. Among the more interesting of the works of his intermediate period was his "Spit of the East" (1838), one of his objects in which was to bring out what he deemed admirable and respectable in the manners and customs of Mohammedanism. From 1847 to 1852 he was M.P. for Stafford. He strongly opposed in lectures and with his pen the Russian War of 1854, maintaining that the assistance offered by France

and England to the Turks was really to the interest of Russia. Various "foreign affairs committees" scattered throughout the kingdom owed their existence to Mr. Urquhart, whose last work of interest, "The Lebanon, a History and a Diary," was published in 1860.

**UR'SA MAJOR** and **URSA MINOR** (the Greater and Lesser Bear), two of the most remarkable constellations of the heavens. See **GREAT BEAR**, **ARCTOS**, &c.

**UR'SIDÆ**. See **BEAR**.

**UR'SON**. See **PORCUPINE**.

**UR'SONE**, a resinous substance obtained from the leaves of the bearberry (*Arctostaphylos Uva-ursi*, natural order Ericaceæ). It crystallizes in colourless needles, insoluble in water, and but slightly soluble in alcohol and ether. It melts at  $200^\circ C.$  ( $392^\circ$  Fahr.), and at a higher temperature sublimes without decomposition. The formula is  $C_{10}H_{16}O$ .

**URSULA, ST.**, a saint of the Roman Catholic calendar, especially honoured in Germany, and particularly at Cologne, which is the supposed place of her martyrdom. The story of Ursula and her 11,000 companions is one of the most curious and interesting of the myths of the middle ages, and in its present form can be traced back as far as the beginning of the twelfth century. According to the legend, Ursula was the beautiful and pious daughter of Deonatus, king of Britain. On account of her beauty she was sought in marriage by a heathen prince named Holofernes, and fearing by a refusal to bring ruin upon her parents and country she gave assent, upon the condition that her suitor should become a Christian, that she should be granted a delay of three years, and that she should be provided with eleven triremes to convey herself and her ten noble companions, each attended by a thousand virgins, on a pious pilgrimage to Rome. These conditions were granted, Holofernes being at once baptized a Christian, under the name of Ætherius, and in due time Ursula and her companions sailed across the sea and up the Rhine as far as Basel. Here they left their vessels and made a pilgrimage on foot as far as Rome, where they were welcomed by the Pope and honourably entertained. On their return journey they fell in unexpectedly with an army of heathen Huns, who had captured the city, by whom they were all slaughtered. Ursula was spared at first on account of her beauty, and was invited to become the bride of the Hun king Etzel, but on her steadfast refusal she was transfixed by an arrow, and thus gained with her companions the crown of martyrdom. No sooner, however, was the wholesale massacre accomplished than a host of celestial warriors appeared, who attacked and defeated the Huns and freed Cologne from their power, the bodies of the martyred virgins being piously interred by the grateful citizens of that city. At a later period they erected a church on the site, which is still occupied by the church dedicated to St. Ursula.

The first traces of this legend are met with in the martyrologies and missals of the ninth century, but in these mention is made either of a small number of virgins, whose names are given, or of a larger but indefinite number. Later references speak of thousands, and ultimately the number of 11,000 was fixed upon. The reason for the latter belief is supposed by some to be found in a misunderstanding of the meaning of the letter M, which, designed to represent "martyred," was supposed to stand for the Roman numeral 1000; while another ingenious conjecture is to the effect that the names *Ursula et Undecimilla* V.V., being the names of two virgins, respectively named Ursula and Undecimilla, were afterwards read as *Ursula et Undecim millia* V.V., or "Ursula and eleven thousand virgins." During the twelfth century an old Roman burying place was ransacked for the bones of the virgins, and though the search revealed the skeletons of men and children as well as of women, together with

stone tablets, coffins, &c., such little discrepancies were easily accounted for, and this immense collection of bones is still exhibited at the church in Cologne as the remains of the martyrs. But a worse discovery still was that of a leading English anatomist, that the bulk of the bones at present shown are not human at all.

See, for a vindication of the story, the work of the Jesuit father Cronbach, "*Ursula Vindicata*" (one vol. folio, Cologne, 1647). See also Schade, "*Die Sage der Heiligen Ursula*" (Hanover, 1854), and the "*Legend of St. Ursula*" (London, 1869).

**URSULINES**, a religious order of women in the Roman Catholic Church, which takes its name from St. URSULA, and which was founded at Brescia in 1533 by Angela Merici, a poor maiden who was born at Desenzano in 1474, died 21st March, 1540, and was canonized 24th May, 1807. The foundress, who had begun at her birth-place, and afterwards continued at Brescia, the pious work of educating poor children, was inspired by the determination to found a new religious order, to consist of a voluntary association of widows and young girls who should undertake the gratuitous education of young children of their own sex, and visit the sick and the poor. The members were to be allowed to live at home, submitting only to such regulations as the nature of their work and other circumstances required, and the order was to be superintended by a priest and a matron or superior. Angela was herself chosen as first matron, 18th March, 1557, by the seventy-six members of the society, and when she died three years later she was succeeded by the Countess Lucrezia of Ladrona. In 1541 the members of the order assumed for their common dress that worn in the country by widows of the middle class. In 1544 the order received the church's sanction from Pope Paul III., and their establishments becoming numerous in Northern Italy, they began to live together in common and to elect local superiors, but without binding themselves even by temporary vows. In 1572, at the instance of St. Carlo Borromeo, Pope Gregory XIII. erected the Congregation of St. Ursula into a religious order, under the rule of St. Augustine, the members adding to the three ordinary monastic vows a fourth binding them to instruct young girls gratuitously. Several of the local congregations declined to become members of the new order, and with the consent of the church retained their first organization unchanged. Thus, after 1572 the Ursulines were divided into the new or "regular" Ursulines, and the "primitive" Ursulines. By 1584 the order had increased to 600 nuns in eighteen establishments, and ten years later a colony was established in France by Françoise de Bermond at Avignon with the special approbation of Pope Clement VIII. In France the order developed very rapidly, and colonies were also in the early part of the seventeenth century introduced into Savoy, Germany, and Canada, the first Ursuline colony in the latter country being founded in 1639 at Quebec by Marie Guyart, known as Mère de l'Incarnation. The order was not quite the same in all countries, and the members were never bound together so strictly as those of most of the other orders. The Ursulines have always been under the jurisdiction of the diocesan bishops. They have at the present day several educational establishments in France, England, Ireland, and America, but they have ceased to exist in Italy, Switzerland, and Germany since 1871.

**URTICACEÆ** is an order of dicotyledonous plants belonging to the group Monochlamydeæ, series Unisexuales. [See BOTANY.] The plants belonging to it are trees, shrubs, and herbs, yielding in some instances a milky juice. They are very generally dispersed over the world. Some of them grow in the most northern regions of the globe, while others are found in the tropics; some flourish among rubbish and dry walls where hardly a speck of other vegetation occurs, while others only inhabit the damp recesses

of gloomy forests. The species are very numerous, many of them being mere weeds, while others are large trees, yielding useful and delicious fruits. This order brings together plants possessing very different properties, and yielding very various and useful products. The stinging nettles form the type of the order, in which is also included the deadly upas-tree. The wholesome fig, the celebrated banyan, and species yielding deadly poisons belong to the genus *Ficus*. The bitter hop, the acid mulberry, and the narcotic hemp are likewise found herein. The famous cow-tree or Palo de Vaca of South America, which yields a copious supply of rich and wholesome milk, also belongs to it. The sap of many of the species, especially those belonging to the division Artocarpeæ, is milky. This depends on the presence of caoutchouc, which in several instances is procured from the plants of this order. The leaves are alternate or opposite, furnished with stipules. The flowers are small, monœcious or diœcious, rarely polygamous, and usually arranged in cymes or heads. The perianth is regular, tubular, or three to five-parted, rarely absent. The stamens are equal in number to the lobes of the perianth and superposed to them. The ovary is free, one-celled (rarely two-celled), with a single ovule. The fruit is a kind of nut, surrounded by the persistent perianth, sometimes winged, sometimes compound. This order is divided by Bentham and Hooker ("*Genera Plantarum*") into eight tribes:—*Ulmæ*, *Celtideæ*, *Cannabineæ*, *Morææ*, *Artocarpeæ*, *Conocephalæ*, *Urticææ*, and *Thelygoneæ*.

**URUGUAY**, or *Banda Oriental*, an independent republic in South America, is bounded S. by the Rio de la Plata, N. by the Brazilian province of Rio Grande do Sul, E. by the Atlantic Ocean, and W. by the River Uruguay. The area is about 70,000 square miles, and the population in 1888 was estimated at 700,000.

*Physical Aspect*.—By far the greater part of the country is hilly and elevated. It forms, as it were, the most southern prolongation of the Sierra do Mar (the sea mountain range of Brazil), which extends northward to near the mouth of the Rio de St. Francisco (19° S. lat.) The range rises rather abruptly from the shore of the Rio de la Plata, but at no great distance inland it takes the shape of an extensive table-land, the surface of which in many places presents hardly any perceptible irregularity, and in others is covered with extensive ranges of low hills. Both the plains and the hills are almost destitute of trees, except in the immediate centre of the country, where there are some small forests, and afford only pasture for cattle. The hills are called *Cochilhas*, and the highest range, which forms the watershed between the ocean and the River Uruguay, is named the Grand *Cochilha*. On the west the table-land seems to extend to the banks of the River Uruguay, but here it is cut by numerous valleys, and presents the aspect of an extremely hilly country.

That portion of Uruguay which extends along the coast to the north of Cape Santa Maria, and about 60 or 80 miles inland, is low, and is part of a very remarkable tract which occupies the eastern coast of South America from 28° to 34° S. lat., or from the island of Santa Catharina to Cape Santa Maria. Through nearly its whole extent it is covered with sand, and is intersected by innumerable lakes of different sizes. The greatest part of this low plain belongs to the Brazilian province of Rio Grande do Sul. It is of very indifferent fertility.

*Climate*.—Uruguay, being situated without the tropics, enjoys a temperate climate resembling that of Spain or Italy. The air is pure and healthy. The winter lasts from May to October. Frost is occasionally felt in July and August. The high table-land is annually exposed to it, sometimes for one or two months together; but as very little snow falls, the cattle find pasture in these districts all the year round. Rain falls pretty freely in winter, but is rare in summer. \*

**Hydrography.**—The principal river is the Uruguay, which originates in that portion of the Serra do Mar which stretches along the ocean opposite the island of Santa Catharina, and runs west for a considerable distance under the name of Pelotas. It takes the name of Uruguay not far from the point where it begins to separate the province of Rio Grande do Sul from Corrientes. Here it assumes the appearance of a large river, and soon begins to bend its course to the south-west. In lat.  $29\frac{1}{2}^{\circ}$  it receives the Ibeuy, and then begins to flow south, forming the boundary between Uruguay and Corrientes and Entre Rios. Not far from the place where it enters the great estuary called the Rio de la Plata, its waters are increased by those of the Rio Negro, which joins it on the left bank. The Uruguay is navigable for large boats to the first great fall, called Salto Grande, situated nearly at an equal distance from the mouths of the Ibeuy and Rio Negro. About 40 miles below the former there is the Salto Chico, or Little Fall, which again interrupts the navigation of the smaller boats or canoes. The whole course of this river is about 1000 miles.

The Ibeuy rises in the Grand Cochilla, and first runs west, but soon turns north, and flows in that direction upwards of 60 miles, after which, having joined the Ibeuy Minim (Little Ibeuy), it again turns to the west, and becomes a considerable river, separating part of Uruguay from the province of Rio Grande do Sul. Its current is almost always tranquil, and the stream is navigable nearly to its head. The whole course of the Ibeuy is about 250 miles.

The Rio Negro has its origin near that of the Ibeuy, and its general direction is to the south-west. It joins the Uruguay about 12 miles before that river enters the Rio de la Plata, after having run upwards of 250 miles.

Two considerable lakes, lying in the eastern plain, belong in part to Uruguay. The largest is Lake Mirim, which signifies the Small Lake, having received this name from comparison with the Lake Los Pos, which is not far distant to the north, but belongs to the province of Rio Grande do Sul. Lake Mirim is 90 miles in length and 25 at its greatest width. It lies parallel to the shores of the ocean, and discharges its waters into the Lake of Los Patos by a wide and navigable channel 50 miles long. The southern half of the lake is situated in Uruguay. The other large lake, the Mangueira, extends between the coast and Lake Mirim. It is 80 miles long and about 4 broad, and empties itself into the ocean at its northern extremity by a short channel. The greatest part of it belongs to Uruguay.

**Natural Resources.**—The valleys on the west and south are well adapted to a great diversity of production, but agriculture is in a very backward state. Small quantities of wheat, rye, barley, Indian corn, rice, pease, beans, water and other kinds of melons, with onions, are cultivated; also some cotton, mandiocca, and the sugar-cane. Hemp and different qualities of flax grow in great abundance.

More than four-fifths of the country being only fit for pasture, cattle constitute its chief wealth. Their flesh is to a great extent converted into jerked beef, which is salted without the bones, dried in the sun, and exported to different parts of America, especially Brazil. Hides, horns, and tallow are also exported in immense quantities. In addition to his cattle every great proprietor breeds a certain number of horses and mules, and some of them a great number of sheep, which have a fine wool. Many of the wealthy proprietors often possess from 30 to 40 square miles of land. Among the wild animals are the tapir, deer, ounce, monkey, paca, rabbit, and fox; and large packs of wild dogs infest the plains.

Wheat and maize are the only corn crops raised, and for both of these the climate and parts of the soil are highly favourable. A railway, opened from the capital to Higueritas in 1875, traverses the most thickly populated por-

tion of the republic. Another line, from the port of Salto to the town of Santa Rosa, finished in 1872, commands to a great extent the traffic of Brazilian merchandise. Two hundred and seventy-one miles altogether were open for traffic in 1886. There are no manufactures in the country. It is well known that a large proportion of the republic is auriferous, and also that lead, iron, and copper ore exist in considerable quantities, but mining has not yet been carried on to any considerable extent.

When the Europeans first arrived, several native nations were in possession of this country, some of whom are still found in the interior, but in small numbers. The present inhabitants are mainly the descendants of Europeans. The European population is constantly being added to by immigration.

**Constitution, Government, &c.**—The Republic of Uruguay, formerly under the government of Buenos Ayres, and then a Brazilian province, declared its independence on 25th August, 1825, which was recognized by the treaty of Monte Video, signed 27th August, 1828. The constitution of the republic was proclaimed 18th July, 1831. By the terms of this charter the legislative power is in the hands of a Parliament composed of two houses, the Senate and the Chamber of Representatives, which meet in annual session, extending from 15th February to the end of June. In the interval of the session a permanent committee of two senators and five members of the Lower House assume the legislative power, as well as the general control of the administration.

The executive is given by the constitution to the president of the republic, who is elected for the term of four years, and cannot be re-elected till after the lapse of four years. A vice-president, also elected for four years, is at the head of the Senate, but has no other political power.

The revenue now amounts to about £2,500,000 annually, and the expenditure is invariably in excess. The public debt therefore increases, and rose from £2,000,000 in 1860 to £12,000,000 in 1886. The chief source of revenue is the customs duties.

The trade of the country has much increased. In 1861 the exports were valued at £800,000, and the imports at £1,000,000; they now average each £5,000,000.

The commercial intercourse of Uruguay with the United Kingdom is of some importance, but variable. Subjoined is a tabular statement of the value of the imports and exports in recent years:—

Year.	Exports from Uruguay to the United Kingdom.	Imports of Home Produce from the United Kingdom into Uruguay.
1884	£656,727	£1,582,963
1885	621,393	1,406,712
1886	413,478	1,353,178

The chief articles of exports from Uruguay to the United Kingdom are tallow, wool, and hides. A considerable trade is done in the export of extract or essence of meat. The exports from the United Kingdom to Uruguay consist chiefly of coal, manufactured cotton, and woollen goods. The total foreign trade of the republic passes through the port of Monte Video, and the goods are principally shipped to France, Great Britain, Italy, Spain, Brazil, and the United States. The metropolis of the republic is described under the head of MONTE VIDEO.

**URUMIAH**, a lake of North Persia, in the province of Azerbaijan, near the Turkish frontier, 30 miles west of Tabreez, and 90 miles E.S.E. of Lake Van. Its elevation is 4100 feet; length, 82 miles; greatest breadth, 24 miles; area, 1730 square miles. The water is of a deep azure colour; specific gravity, 1.135, the same as one estimate of the Dead Sea water; amount of salt in 500 grains,

102·1, or 21·4 per cent., very nearly the same as in the Dead Sea. The water is intensely salt, and evaporates so fast that a person coming out of it is immediately covered with a thick white deposit. Large quantities of salt are taken from it for supply of the regions adjoining. It is described as containing no living thing but a species of *Fucus*, which is thrown up in heaps on the shore, and generates noxious effluvia. Sulphuretted hydrogen gas is generated in the lake itself. The water is said to be retiring from the shores at the rapid rate of half-a-mile in eighteen years; and the whole lake, from its heavy stillness and want of life, has a very unnatural appearance. The adjoining plains contain deposits of gypsum and rock-salt, parts of the great tertiary deposit of the frontier chain westwards, which here spread widely out.

**URUMTSI**, a large city of Southern Dzungaria, Mongolia, at the northern base of the Eastern Thian-Shan Mountains, between Turfan and Manas. It lies in a fertile pastoral district, and has a large garrison and convict establishments. It is a most important point on the military and trade route from Peking via Banta, and Hami to Kulja, and hither goods come from Russia and Turkestan, Bokhara and Persia, so that the town appears like a continual fair. It lies at the foot of the triple-crested Bogdu-ola (11,000 feet), and in the neighbourhood are hot sulphur springs. The town is the Bish-Bakil of the middle ages. The population is about 15,000.

**URUS** (*Bos primigenius*) is a species of Ox which formerly inhabited the forests of Central Europe, and was described by Cæsar in his account of the animals of the Black Forest. "They are," he says, "little inferior to elephants in size, and resemble bulls in appearance, colour, and shape. Great is their strength and great their swiftness. They spare neither man nor beast that they have caught sight of. They are caught in carefully constructed pit-falls and then killed. By this toil the young men make themselves hardy, and occupy themselves in this kind of hunting; and those who kill a great number exhibit publicly the horns as evidence of the fact, and so win great praise. But not even when taken very young can these animals become used to men or tamed. The horns in size, shape, and quality differ much from those of our oxen. These are much sought after, and mounted with silver at the free ends, they are then used as goblets at the great feasts" (Cæsar de Bello Gallico, vi. 29). The above description is less applicable to the European Bison or Aurochs (*Bison bonasus*), which still survives in Lithuania and some parts of the Caucasus, than to some huge long-horned species of ox. There can be but little doubt that the urns of Cæsar is the *Bos primigenius*, of which the wild cattle of Chillingham appear to be more or less pure descendants. The Pembroke breed of oxen are also considered to be descended from this species.

**USE.** A use, at common law, was a beneficial interest in land, distinct from the legal property therein. The origin of uses is derived by Gilbert ("Law of Uses," 3) from a title under the civil law, which allows a usufructuary interest, distinct from the ownership of the thing itself. He says it was introduced by the clergy, who were masters of the civil law, and who "when they were prohibited from taking anything in mortmain, after several evasions by purchasing lands of their own tenants, suffering recoveries, purchasing lands round the church and making them churchyards by bull from the Pope, at last invented this way of conveying lands to others for their own use; and this being properly matter of equity, it met with a very favourable construction from the judge of the Chancery court, who was in those days commonly a clergyman. Thus the way of settlement began; but it more generally prevailed among all ranks and conditions of men by reason of the civil contentions between the houses of York and Lancaster, to secrete the possessions, and to preserve them

to their issue, notwithstanding attainders; and hence began the limitation of uses with power of revocation." But whatever may have been the origin of uses, it is certain that the desire of effecting secret transfers of property without resorting to the modes of conveyance of the common law, as well as the desire to dispose of landed property by will or devise, which the common law did not allow, led to an early adoption of the system.

The person who was entitled to the use was called the *cestui que use* (pronounced *settiky use*). He had no means of maintaining his title to the use except by the writ of subpoena, whereby the person who had the legal estate in the land, the feoffee to uses, was bound to appear in Chancery, and was compelled to answer upon oath as to the confidence reposed in him.

A use was descendible, according to the rules of the common law, respecting estates of inheritance. It was also alienable by deed, and divisible before the statute of wills, the courts of equity having favoured this method of evading the strictness of the common law, which allowed no transfer of land without livery of seisin. But the *cestui que use* had no legal ownership. The feoffee was still complete owner of the land at law. He performed the feudal duties, his wife had dower, and his estate was subject to wardship, relief, &c. He might sell the lands, and forfeit them for treason or felony.

The system of uses having been found to produce many inconveniences, notwithstanding various statutes which had been passed from time to time to modify them, it was thought a remedy would be found by joining the possession to the use, or, as it is usually termed, transferring uses into possession. With this view the statute of 27 Hen. VIII. c. 10, commonly called the Statute of Uses, was passed. The provisions of this statute can only be fully explained in a treatise on the system of uses. On the Statute of Uses has been founded the system of conveying and making settlements of property in land which is now in use in England.

The word "trust" is now used instead of "use" where the object is to confer a beneficial as distinguished from a legal estate. See TRUST AND TRUSTEE.

#### USES, CHARITABLE AND SUPERSTITIOUS.

The term "charitable use" has a very extensive legal meaning, and includes dispositions of property which are not in ordinary language described as charitable, but which are so called with reference to the purposes enumerated in the statute 43 Eliz. c. 4, or such as are considered analogous to them. That statute enacted that the commissioners thereby empowered should inquire as to the lands, &c., given by well-disposed people "for relief of aged, impotent, and poor people; for maintenance of sick and maimed soldiers and mariners, schools of learning, free-schools, and scholars in universities; for repair of bridges, ports, havens, causeways, churches, sea-banks, and highways; for education and preferment of orphans; for or towards the relief, stock, or maintenance of houses of correction; for marriage of poor maids; for supportation, aid, and help of young tradesmen, handicraftsmen, and persons decayed; and for relief or redemption of prisoners and captives, and for aid or use of any poor inhabitants concerning payment of fifteens, setting out of soldiers, and other taxes." The term "charitable use" is applicable only to gifts for what are called public charities, the objects of which are not particular individuals, but a class or the public in general.

The 24 Vict. c. 9 was passed to amend the law relating to the conveyance of land for charitable uses, and provided that no future deed for charitable uses should be void by reason of its not being indented, nor by reason of its containing any stipulations for the benefit of the donor, nor in case of copyholds by reason of the assurance thereof not being made by deed. It also provided that if any of the uses were declared by any separate deed, they must

be enrolled in Chancery within six months after the making thereof.

The subject of "charitable uses" is closely connected with that of "mortmain," for the same policy which from the earliest times required corporate alienages of lands to obtain licenses to hold them from the crown (a policy enforced and extended by Edward I. in the statute *De Religiosis*, and again by Richard II. in reference to the then newly invented conveyance of lands to the use of religious houses), was soon held to extend to the case where lands, though not conveyed to corporate bodies, were given on trust for what were called "superstitious uses;" that is to say, to large bodies of trustees, with ultimate survivorship, for parish churches or other institutions "erected and made of devotion." And such grants were by statute 23 Hen. VIII. c. 10, declared to be void if made for a longer time than twenty years, a restriction which is still in force, unless in a case where the provisions of some of the modern Acts for augmenting poor livings and similar objects apply. See, for example, 17 Car. II. c. 3, and the 19 & 20 Vict. c. 104, sec. 23, for making better provision for the spiritual care of populous parishes.

**USHANT** (Fr. *Ouessant*), the chief of seven islands known as *iles d'Ouessant*, belonging to the department of Finistère, about 11 miles from the nearest coast of France, and 25 miles W.N.W. of Brest. Extreme length nearly 5 miles, breadth 3 miles. The population is about 2400. The shores are bold and rocky, and the landing-places few. The formation is mainly granitic, and the soil is fertile, with excellent meadows and pasture lands, and many horses and sheep are reared. The inhabitants are principally occupied in fishing. The lighthouse is in lat. 48° 28' N., lon. 5° 3' W. Off Ushant the British fleet under Sir Edward Hawke gained a victory over the French under Admiral Conflans, on 20th November, 1759; and there was an indecisive action between the English under Admiral Keppel and the French under Count d'Orvilliers, on 27th July, 1778.

**USH'AS** (from the root *us*, to burn, the same word as the Latin *ureo*, *ustum*), the Dawn-goddess of that Vedic mythology which forms the oldest Indian religion, older by far than Brahmanism. Ushas not only has the functions of the Greek *Eos*, but *is* that goddess. The Sanskrit and Greek names are but forms of the same word; and hereby we get one more added to the many proofs of the common origin of all the Aryan tongues. Before the Persian, the Hindu, the Greek, the Latin, the Teuton, the Cymry, and the Celt separated, they worshipped the Dawn (*Ushas*, Greek *Eos*), and the blue vault of heaven (*Dyaus*, Greek *Zeus*, *Theos*, Lat. *Deus*), and such elemental gods. This carries us back to a time compared to which even Egyptian, Chinese, or Assyrian records are as things of yesterday.

Ushas has another Sanskrit name in the Vedas, *Dahana*; and this gives us the Greek *Athena*, and also *Daphne*, the latter form of the word still existing for ourselves in the English "dawn."

The Vedas show us the Dawn-goddess as recreating the world each day, awakening her children and breathing new life into them. Since "to awake" is the same in Sanskrit with "to know," Ushas or Dahana quickly came to have the attribute of wisdom, and it is this side of her character which the Greek *Athena* intensifies, although the elemental side is still also clearly apparent to the student.

A Vedic hymn to this great goddess, purest and most beautiful of the religious myths of India, begins thus:—

"Ushas, daughter of heaven, dawn upon us with richest Ushas, diffuser of light, dawn upon us with plentiful food! Ushas, goddess of beauty, dawn upon us with abundance of cattle!

"All-protecting Ushas afar off has mustered her chariots, before the sunrise, and hither comes in glory, with a hundred chariots, to men.

"First of all the world wakes she, first she tramples upon

the flying darkness! She, the mighty, the light-giver, looks down on all things from on high! She, youthful ever, ever granting youth, first of the gods appears to us when we invoke them."

**USEK**, a small market-town of England, in the county of, and 12 miles south-west by south from Monmouth, and 157 from London by rail, is situated on the eastern bank of the River Usk, over which is a stone bridge of five arches. The town consists of several streets, in which many of the houses are separated from each other by gardens. It contains a town-hall, prison, an established church in the Anglo-Norman style, and places of worship for dissenters. The ruins of an ancient castle stand on an abrupt eminence on the bank of the river, which is famous for its salmon fishery. The population of the town is 1470.

Usk is a place of remote antiquity, and appears to have formerly been of much more importance than at present. The ancient castle was formerly one of the most considerable structures of its kind in the country. It came through the Mortimers, earls of March, into the possession of the crown, and was the favourite residence of Richard, duke of York, whose sons, Edward IV. and Richard III., were born within its walls. At a subsequent period it belonged to the Earls of Pembroke.

**US'NIC ACID** or **US'NIN**, an acid obtained from various species of lichen, especially *Usnea florida* and other varieties of *Usnea*; it is also found in *Parmelia*, *Cladonia*, and *Ramalina*. It crystallizes in yellow needles, which are insoluble in water and alcohol, but soluble in ether and in turpentine. The formula is  $C_{18}H_{16}O_7$ . It melts at 200° C. (392° Fahr.) It forms salts with bases called usnates, which have the general formula  $C_{15}H_{17}MO_6$ . Those of the alkalies are soluble in water. The acid is soluble in alkaline solutions, which become red on exposure to the air, and finally black. The potassium salt ( $C_{18}H_{17}K(O_7, 6H_2O)$ ) crystallizes in colourless plates.

**US'SHER** (commonly **USHER**), **JAMES**, an illustrious scholar and prelate of the Irish Episcopal Church, was born of good parentage at Dublin, 4th January, 1581. In 1593 he went to the newly-opened University of Trinity College, Dublin, of which he was one of the three first students that were admitted. At the college he soon became distinguished for careful and studious habits, and in 1600 he took his degree of M.A. The following year he was ordained deacon and priest by his uncle, the Archbishop of Armagh, and was shortly afterwards appointed afternoon lecturer at Christ Church, where he attained immediate popularity as a preacher. In 1603 he became chancellor of St. Patrick's, and about this period he visited England, where he became acquainted with Sir Thomas Bodley, Sir Robert Cotton, Camden, and other distinguished persons, and subsequently for a considerable period he made a journey to England about every three years. In 1607 he took the degree of B.D., and was chosen professor of the faculty of divinity in his college, an office which he held for thirteen years. In 1615, at the request of the Irish Convocation, he drew up a body of 101 articles of faith, which were sharply and decidedly Calvinistic in their tone, and differed much from those of the sister Church in England. In 1621 King James nominated him Bishop of Meath, and in March, 1625, he was appointed Archbishop of Armagh and primate of all Ireland. He found his position one of considerable difficulty, and he contended strongly against the principle of toleration as applied to Roman Catholicism, and also against the efforts of Laud to force the Irish Church into greater conformity with that of England. In 1640 he came over to London, and the following year his house at Armagh was attacked by the rebels, and he was plundered of nearly everything he had except his library. Upon this Charles I. conferred on him the bishopric or Carlisle in *commendam*, but the

revenues of the bishops were shortly afterwards confiscated by the Parliament, and it brought him but little emolument. In the struggles of the Civil War Ussher sided with the king, but spent most of the time in obscurity; but in 1647 he was chosen preacher to the Society of Lincoln's Inn, and he preached regularly during term time in the chapel of the Inn for nearly eight years. He died after a short illness at Reigate, 21st March, 1656. Cromwell ordered a funeral for him at Westminster Abbey, but left the expense to be defrayed by his relatives.

Ussher's works are numerous, and include "De Ecclesiæ Christianarum Successione et Statu" (1618), and "An Answer to a Challenge made by a Jesuit" (1625), writings of a polemical and controversial character; "Britannicarum Ecclesiarum Antiquitates" (1639, enlarged edition 1677), a historical account of the British Church down to the seventh century; "Polycarpi et Ignatii Epistolæ" (1to, Oxford, 1641; London, 1647); "Annales" of the Old Testament (folio, London, 1650; second part, fol. London, 1651); "Chronologia Sacra," published after his death (Oxford, 1660); sermons on various occasions, numerous editions of parts of the Fathers and dissertations on their writings, and several papers on ecclesiastical law and polity. Ussher was a man of great erudition and industry, of profound and earnest piety, of unworldly and saintly temper and a devout and holy life. He was also a man of large and tolerant views, except in dealing with Roman Catholicism, but he lacked the strength of character necessary to a public man in the troublous times in which his lot was cast. The best edition of his works, to which a life is prefixed, is that of Dr. Elrington, professor of divinity in Dublin University (sixteen vols. 1847). The chronological figures often printed on the margin of the Authorized Version of the Scriptures in England, are based for the most part upon the computations of Ussher. It is perhaps quite unnecessary to add that these are now altogether out of date, being based upon scanty materials and insufficient scholarship.

**USTILAGINEÆ** is a group of minute FUNGI belonging to the order Hypodermia. The Ustilagineæ are parasitic in the tissues of higher plants, several infesting cereals. They consist of a mass of interwoven hyphae bearing spores. Two species are especially destructive, *Tilletia caries*, which produces the SMUT of wheat and other cereals, and *Ustilago carbo*, which attacks oats especially, and produces the disease known as BUNT-EAR.

**USURY.** This word comes from the Latin *usura*, or, as it is more frequently used, *uauræ*, in the plural number. The Latin word signifies money paid for the use of money lent. The old term in use in England to signify what we now call interest seems to have been usury; but after the maximum rate of interest had been fixed by law the word was used to signify the taking of more interest than the law allowed, while at the present day it is usually applied only to exorbitant rates of interest.

In early times it was considered a great moral wrong for one who lent money to require in payment anything more than the money lent, and we find the practice expressly forbidden by some of the ancient legal codes. Thus the law of the Hebrews, as given in the Pentateuch, strictly forbade any interest from being taken from any poor person, and in the earliest enactments, from any one. Later enactments exclude foreigners from the benefits of this restriction, but the prohibition against taking interest from a brother Hebrew continued in force to a late period. As commerce increased the practice of usury, in the old sense of the word, grew up, but allusions in the Psalms, Proverbs, and prophetic writings show that by the devout among the Hebrews it was always regarded as discreditable, and the pious and zealous reformer Nehemiah gives a lively account of his contest with the money-lenders of his day in respect to it in Neh. v. 1-13.

The laws of Menu allow interest even to the extent of 18 or 24 per cent., but the ancient laws of Egypt restricted the practice, and the Koran absolutely forbids it.

At the present day the old prejudice against interest has almost died out, and it is no longer considered wrong to pay for the use of money any more than for the use of a house, a horse, a boat, or any other property. The fact, however, that the nature of money makes it easier for the lender to oppress the borrower, has at various times and among most nations caused the maximum rate of interest to be fixed by law. In England, in the reign of Henry VIII., this rate was fixed at 10 per cent.; in the time of James it was reduced to 8 per cent.; during the period of the Commonwealth it was 6 per cent., and this was the rate during the reign of Charles II.; and by the statute 12 Anne, s. 2, c. 16, passed in 1713, it was reduced to 5 per cent., beyond which rate, with certain exceptions, it was illegal to charge interest for considerably over a century. Subsequently the opinion that money should be borrowed and repaid, or bought and sold, upon whatever terms the parties should agree to, like any other property, gained ground, and various Acts modifying the terms of the usury laws were passed, until by the 17 & 18 Vict. c. 90 the whole of these laws were repealed, and it is now lawful, with certain exceptions, to contract for any amount of interest. The law, however, still restricts the amount of interest which may be charged by pawn-brokers upon loans under £2 [see PAWN-BROKING], and the courts under special circumstances frequently relieve persons who have undertaken to pay exorbitant rates of interest to unconscionable money-lenders.

The law does not recognize the charge of interest upon interest, or, as it is called, compound interest. This, however, is a rule easily evaded by the borrower granting a further acknowledgment of the interest as though it were principal; such new contract changes the interest already due into a principal sum. The law also recognizes rests in mercantile and banking accounts, in which interest is charged upon a former ascertained balance. Such balance often includes interest already due; and thus the creditor really receives interest upon interest, or compound interest.

Debts do not always carry even simple interest from the time when the money becomes due to the creditor; in such case payment of interest is rather the exception than the rule. Unless the debt be such a debt as carries interest by the custom of merchants or traders, or unless there is an express agreement to such effect between the parties, or unless such agreement can be inferred from their course of dealing, or unless there are some very special circumstances, debts do not carry interest from the time when due. But by 3 & 4 Will. IV. c. 42, a jury may, if they think fit, upon all debts or sums certain, allow interest to the creditor, at any rate not exceeding the current rate of interest, from the time when such debts or sums were payable, if payable by virtue of a written instrument at a certain time; or if payable otherwise, then from the time of a demand of payment in writing, so as such demand give notice that interest will be claimed from the date of such demand. This statute also empowers juries to give damages, in the nature of interest, in respect of the detention or appropriation of goods. By 1 & 2 Vict. c. 110, all judgment debts are to carry interest at the rate of 4 per cent. per annum from the time of entering up the judgment.

**UT**, the ancient name of the note more commonly termed *Do*, in the solmization of music. *Ut* is still used in France, though not in England or Italy. It is the keynote of the scale; and as the key of C gives the "natural" scale, *ut* corresponds, when no other keynote is specified, to the note C. It is the first word of an old Latin hymn to St. John the Baptist ("Ut queant laxis," &c.) used by Guido in teaching music. See GUIDO.



**UTAH**, a territory of the United States of North America, originally a part of Upper California, ceded to the United States by the treaty with Mexico in 1848, was erected into a separate territory in 1850. It is bounded on the N. by the territory of Idaho, on the E. by Colorado, on the S. by Arizona, and on the W. by Nevada. It is about 345 miles long and 320 wide. In 1868 a small portion of Utah was taken to form the new territory of Wyoming. The area of that which remains is about 82,190 square miles.

*Face of the Country.*—This territory is generally an elevated, mountainous, and barren region. The central part is traversed by the Wasatch mountain range, the direction of which is nearly north and south. The portion of Utah which lies west of this mountain range forms part of the Great or Fremont Basin, which has a general elevation of 4000 or 5000 feet above the level of the sea. This arid and sterile basin has its own system of lakes and rivers, which have no communication with the ocean. The eastern part of it is covered with a white incrustation of saline and alkaline substances. The Wasatch Mountains rise to a height varying from 4000 to 7000 feet above the adjacent plains or valleys, and some of the peaks are covered with perpetual snow. Other ranges of mountains occur in various parts of Utah. Some of the valleys in the settled part of the territory have an elevation of about 6000 feet above the level of the sea. On the east side of the Wasatch Mountains is an extensive plain or valley, almost as sterile as that which occupies the western part of Utah.

Of the geology of Utah as yet comparatively little is known. Volcanic rocks are found in various parts, and granite, jasper, syenite, porphyry, and quartzes are abundant. There are also ridges of carboniferous limestone, and marble of all colours is found in large masses on the slopes of the mountains in many places.

*Lakes and Rivers.*—Great Salt Lake is the prominent object to be considered in treating of the waters of Utah. This extensive and peculiar sheet of water, lying north-east from the centre of the territory, is about 70 miles long and 30 miles wide, with no visible outlet. The water is so highly saline that no living thing can exist in it, and by the evaporation in hot weather leaves on its shores a thick incrustation of salt. According to Fremont's analysis of some of the salt of this lake, there were in 100 parts 97·80 of chloride of sodium, or common salt; sulphate of lime, 1·12; chloride of magnesium, 0·24; and sulphate of soda, 0·23. In the saltness of its waters, in the circumstance of its having no outlet, and being fed from another smaller and fresh-water lake (with which it is connected by a stream called the "Jordan"), and in the rugged and repulsive character of some portions of the surrounding region, it bears a remarkable resemblance to the Dead Sea of Palestine. Instead, however, of lying 1000 feet below, it is more than 4000 feet above the level of the sea; its waters, moreover, being an almost pure solution of common salt, are free from that pungency and nauseous taste which characterize those of the Dead Sea. The water is almost transparently clear, and of an extremely beautiful bright green colour. The fresh-water lake which is connected with the Great Salt Lake is about 25 miles distant. It is nearly 35 miles in length, and is stored with trout and other fish. Both lakes are elevated from 4200 to 4500 feet above the sea. In the interior are several small lakes, which are the recipients of the streams of the interior basin, and are often mere sinks or sloughs. The most important of those known is Sevier Lake. There are many thermal and salt springs.

As before stated, the rivers of the Great Basin have no apparent connection with the ocean, but all either discharge themselves into the interior lakes or are absorbed by the sands of the desert. The principal streams of Utah are

the Colorado, the Green, the Grand River, the Sevier, and the Bear River. Only a small part of the Colorado is included in this territory. Green River, after crossing the northern border, traverses the eastern part of Utah, flowing south, and unites with the Grand River to form the Colorado, which flows south-west into Arizona. Grand River, rising in Colorado, crosses the eastern boundary of Utah, and flows south-west until it unites with the Green River. The Bear River rises in the north-east part of Utah, and flows first north into Idaho. Having returned into Utah territory, it pursues a south-west course and enters Great Salt Lake. Sevier River rises in the south central part of the territory, and terminates in Sevier Lake, which is about 39° N. lat. The Weber River is a small tributary of the Great Salt Lake. Its general direction is nearly north-west. None of these rivers are navigable.

*Minerals.*—Iron ore abounds in some places, and a lead mine has been opened near Minersville. It is stated that gold, silver, copper, zinc, large quantities of bituminous coal, sulphur, alum, borax, and petroleum have been discovered; but the mineral resources of this territory have not yet been developed, mining enterprises not being much encouraged by the leaders of the Mormons.

*Climate.*—The climate of the great plateau between the Rocky and Sierra Nevada Mountains seems to partake of the characteristics of the great Tartar plains of Asia. According to Orson Pratt, the midsummer is dry and hot, the heat ranging at midday from 90° to 105° Fahr., but with cool mornings and evenings, refreshed with mountain breezes. The winters are mild, snow seldom falling more than a few inches deep in the valleys, nor does it lie long. Spring and autumn, though mild, are subject to sudden changes, and the wind is very variable, shifting, almost every day, to every point of the compass. Rain seldom falls between April and October, but when heavy showers do come they are generally accompanied by thunder and hail, and sometimes with strong winds. Dr. Bernhisel and Mr. Snow say that the climate of Great Salt Lake City, in lat. 40° 45' N., is milder and drier than the same parallel on the Atlantic coast, and the temperature more uniform, the thermometer rarely descending to zero. During three years, according to observation, the highest point attained by the thermometer was 100° above, and the lowest 5° below zero. The variation between the temperature of day and night, in midsummer, is from 20° to 40°. Frosts in Utah Valley occur as late as the last of May and as early as the first of September.

*Soil and Productions.*—However wild their religious views, fantastic their ecclesiastical organization, and odious their polygamy, no colonists have ever been more successful than the Mormons, for they have converted a naturally barren land into a lovely region of cultivated fields, rich orchards, flower-filled gardens, and pleasant residences. Still but a very small portion, comparatively speaking, of Utah can ever be made available in producing food for man or beast. The fertile spots are found in the valleys watered by the pure streams flowing from the neighbouring mountains. The line of Mormon settlements occupies the valleys from north to south, lying near the western base of the Wasatch range.

Bear, Great Salt Lake, Utah, South, Sevier, and Land Pitch Valleys, are the principal agricultural districts. The upper portion of the valleys of the Green and Grand Rivers is represented as "incapable of supporting any population whatever. The Uintah and Green River Valleys, lying lower down on the tributaries of the Colorado, are, however, not so sterile."

Wheat, rye, barley, buckwheat, Indian corn, and the garden vegetables of the middle states, are the products of Utah. There is a fine bunch-grass, which, owing to the dryness of the climate, does not decay, but furnishes fodder for the cattle during winter, without being made into hay

in the ordinary way. The Indian corn and vines are liable to be blighted by early and late frosts. The experiments in rearing fruits have been attended with great success.

Timber is scarce throughout the territory, except on the mountains, and is principally composed of pine and fir trees. There are some groves of cottonwood and box-elder, and a scrub cedar in some of the valleys. Wood, both for building and fuel, is scarce.

**Animals.**—This region is scarcely more fruitful in animal than vegetable life, but elk, deer, antelopes, grizzly bears, cougars, beavers, porcupines, mountain sheep, foxes, and wolves are found. Water-fowl are abundant in the lakes, and trout and very fine salmon in the mountain streams.

**Manufactures.**—Much progress in manufactures is hardly to be expected in a settlement so lately formed; but the more necessary implements of husbandry and housewifery, and the cheaper stuffs for clothing, are made in somewhat considerable quantities. The articles made are generally of a very superior description, many of the immigrants being skilled English artisans.

The trade of Utah is pretty much confined to traffic with the overland emigrants to California, and with the miners of Idaho, Nevada, Colorado, &c., who obtain here supplies of provisions and live stock. The Union-Pacific Railway passes through the State.

**Religion.**—The Mormon Church is governed by a series of hierarchies, the highest of which is styled the First Presidency, composed of three persons. The next quorum in authority is the Twelve Apostles. The third quorum is the Seventies. The seventy members that constitute the first quorum of seventies are all presidents of the first ten quorums of seventies. The Mormons are required to give one-tenth of their property to the support of their religion. Further particulars of the Mormon religion are given in the article MORMONS.

Utah is divided into seventeen counties; the capital is SALT LAKE CITY. The population is principally composed of Mormons, who settled here in 1847, after their expulsion from Missouri and Illinois. At the census of 1880 there were 143,963 inhabitants.

**History.**—The materials for a history of Utah are very meagre. It was a part of the territory of Upper California acquired from Mexico by the treaty of 1848, after the conclusion of the war with that country. Previous to 1847, when the Mormons commenced directing their steps thither, it had been in possession of the miserable tribes that gained a most precarious living from its churlish soil, undisturbed except by the occasional visits of exploring parties or roaming trappers and hunters. Utah was organized as a territory on the 9th of September, 1850. The name is derived from an Indian tribe, Yuta, or dwellers in the mountains.

**U'TAKAMAND' (Ootacamund, Ontikamanda),** a municipal town in the Nilgiri Hills District, Madras. It is the headquarters of the Nilgiri Hills District, and the chief sanatorium of the Madras Presidency, being 7228 feet above sea-level. The annual rainfall is 44.88 inches, and the mean temperature 58° Fahr. The variations of the temperature average about 18° in the twenty-four hours, and the extremes in the shade are from 38° minimum in January to 76° maximum in May. The nearest railway station is Mettupalaiyam, 327½ miles from Madras, on the Madras Railway. Utakamand has gradually become the summer headquarters of the governor of Madras. But the offices of the Madras government and its chief departments remain throughout the year at the presidency town.

The plateau of Utakamand was discovered in 1819 by two Madras civilians while in pursuit of a band of tobacco smugglers. In 1821 the collector of the district built the first house, and a town after a time grew up. The station reposes in an amphitheatre encircled by noble hills, and

adorned by an artificial lake nearly a mile and a half long. The Nilgiris lie in the upheaved southern angle formed by the junction of the two mountain systems of the Indian peninsula, namely, the Eastern and Western Ghats. Their lofty heights give a majesty to the region, culminating in Dodabetta Peak, 8760 feet above the level of the sea. Five other mountains, including the well-known Elk Hill, have elevations exceeding 8000 feet. The lake, with a smooth carriage road round it, forms a fitting gem in the centre of the station, on which the European houses, perched on the adjacent hills, look down. A splendid vegetation, belonging to the temperate zone, but here growing with tropical luxuriance, refreshes the eye of the traveller from the plains, delicate European plants rising into hardy shrubs, and English flowers forming hedgerows. The outdoor life is a joyous and characteristic feature of the place. Riding, driving, and all manly sports are possible. For Utakamand has a great advantage over Simla and other Himalayan hill stations, in being situated on an extensive plateau, with wide tracts of grass land, and downs suitable for roads, in its neighbourhood.

The number of European visitors is greatest from March to June. From November till February, when the climate is at its best, the population consists almost exclusively of permanent residents. The large number of European coffee-planters around Utakamand gives its resident society an unusual stability. The place is well supplied with churches, hotels, schools, hospitals, shops, &c. The botanic gardens are 51 acres in extent, and were established to improve horticulture by the acclimatization of foreign plants, and by the distribution of seeds and plants, &c. The resident population is about 12,000.

**UTERUS or WOMB,** in the human subject, lies in the line of the axis of the outlet of the female pelvis, its base directed upwards and forwards, and its neck slightly backwards—in other words, sloping a little forward from the vertical. A section of the female pelvis shows it to lie immediately behind and a little above the bladder, and between this and the rectum (bowel). When unimpregnated it measures about 3 inches from the mouth to the base, 2 inches from side to side, and 1 inch from back to front. It is somewhat pear-shaped in form, and weighs 1½ oz. There is scarcely any cavity, for the walls are half an inch thick, made up of muscle-fibres crossing in every direction. Round the mouth (which opens into the vagina) they mass themselves circularly to form a kind of sphincter. The uterus is peculiar to mammals, and varies greatly in size and shape, as well as in plan. There are always two ovaries, bodies whose function it is to supply ova to the uterus for impregnation, and there are always Fallopian tubes (so called from Fallopius, their discoverer), to conduct the ova to their destination. It is manifest, therefore, that in the simplest conditions the two ovaries and oviducts would be as distinct as the two eyes or two noses possessed by all mammals. This condition still remains in the lowest mammals, such as the monotremes and marsupials. Here the two oviducts expand into two uteri, and these open each by its own mouth into two vaginæ, or into a general cloaca common to the uterine and excretory organs in the simplest form, the monotremes. In the adult marsupials the uteri, separate at their bases, coalesce by their mouths, and form one opening into the vagina, which is here single. It is only in the monkeys and in man that the two uteri have completely coalesced into one, the earlier form being indicated by the separate ovaries and oviducts, and by the pear-shaped form, with its two depressions or *cornua* at the extremities of the base.

The uterus is so suspended in the pelvis as to be secured against injury by the varying size of surrounding organs, or by sudden jars or shakes; and its muscular construction is such as to allow of a most remarkable power of distension after impregnation and during the growth of the embryo.



**UTGARD** (literally "out-yard," i.e., outer place), in the Norse mythology, is the realm far away from Asgard (Heaven), lying beyond Midgard (Earth), and inhabited chiefly by the Jotuns or giants.

**UTICA**, an ancient African city of the Phœnician race, reputed to be older than Carthage herself, and in the palmy days of Rome's great rival rather her ally than her subject. Utica was 27 miles distant from Carthage, on the seashore. The ruins are now at a considerable distance inland, owing to variations in the delta of the river Bagradas.

Utica assisted Rome in the last Punic War, and received as a reward the bulk of the dominions of Carthage. Cato the Younger (great grandson of Cato the Censor) is often called Cato of Utica (*Cato Uticensis*), because he was born here, and is thus conveniently to be distinguished from the other members of his great family. He was a sincere aristocratic republican, joining the Pompeian party for that purpose, and firmly opposed the great Julius Cæsar's grasp of the supreme power. After Scipio's defeat and death at Thapsus (B.C. 46), Cato took command of the Pompeian army, and retired to Utica, and there held out, the sole city in Africa, against the great dictator. But Cæsar marching towards him, and his fellow-soldiers and the townsmen plainly showing a disposition to submit tamely to the yoke, Cato became weary of life and slew himself. This is the subject of Addison's fine play.

**UTICA**, a city in the New York state in the United States, 80 miles west of Albany, on the Mohawk River, Erie Canal, and Central Railway, whence several lines diverge. The surrounding district is very fertile, and the town has a flourishing transit trade, besides cotton factories, woollen mills, iron-foundries, tanneries, and various manufactures. Its chief buildings are its many churches, the city hall, the asylum, and the opera-house. The population in 1880 was 33,913. The town is built on the site of the old Fort Schuyler, built in 1756.

**UTILITARIANISM**, a school of philosophy, whose founder was Jeremy Bentham, and which bases itself on a reference to the great principle which he enunciated, "the greatest happiness of the greatest number." The opponents of this school taunt it with confining that happiness exclusively to the material and economic-welfare of the multitude, and with studiously disregarding all higher considerations. But that such is not the aim of their doctrines was clearly shown by Mr. John Stuart Mill, in his "Essay on Government" and his "Utilitarianism." The term is, in fact, a nickname, and contains as little truth as do most nicknames. Every statesman who rises to the full height of his vocation, and has a clear sense of his duties and responsibilities, must take a utilitarian view of human affairs, and devote his efforts to the furtherance of all wise schemes of moral, social, and political reform.

But the stronghold of the Utilitarian position is in the adoption of a certain and definite standard whereby to judge moral questions. If one adopts the theory of the Moral Sense, and considers that conscience is as natural as sight or hearing, one is confronted with the fact that what seems right to the ignorant is wrong to the wise, and what was right in ancient times is wrong now; moreover, what is right at one time is wrong at another, even in the same day. Right and wrong are easily shown to differ with time, with place, and with circumstance, if the judgment is to be the consensus of mankind. Now, on the other hand, red was red and treble was treble in Adam's time as now, under all circumstances and in all places alike. The analogy is therefore quite misleading.

If, instead of this test of inner consciousness, we adopt something verifiable, something which can be made a matter of argument and demonstration, we advance towards a useful standard. Now, with our views of the goodness of God, surely no reasonable man would for an instant deny that whatever is right must be for the good

of the world, what is right for man must be for the good of man, using these terms in their widest and highest significance. And one who thinks that right is perceivable by a moral sense will agree with this just as well as one who regards the conscience as a growth and a development inherited and enlarged from the ages. It follows that we shall be secure in adopting that course which shall appear to be for the greatest good of the greatest number; and if subsequent events shall show a different course to be better we shall vary our course to square with our improved views. In criticising actions we must of course not think only of our own good, but of the good of others as well as of ourselves; and further, we are bound to subordinate private good to the general good.

The end of conduct, according to the Utilitarians, is happiness:—

"Happiness, our being's end and aim,"

and this has led to its being very improperly stigmatized as a "selfish theory." On the other hand, what has gone before is sufficient to show that it is an eminently altruistic or unselfish theory. Those who loftily prefer to seek after virtue alone, will be found, on closer examination, to be engaged in bettering the lot of some one by their virtuous conduct, if it is truly worthy of that name, that is to say, in forwarding the general happiness. Thus they are Utilitarians against their will.

It must not be supposed that Utilitarians disregard conscience. They set as great store by its dictates, and act as promptly upon them, as do the upholders of an innate Moral Sense. The difference between the two schools is, that the Utilitarians regard the conscience as an inherited development, and as being capable of still further development, so that future ages will inherit a truer and more sensitive conscience than we possess, if we faithfully do our work towards enriching it by probing by the hard teachings of experience to broaden and raise our views of what is right.

**UTOPIA** (Gr. *ou*, not, and *topos*, a place), the title of a political romance written by Sir Thomas More, and the name that he gave to an imaginary island, which he represents to have been discovered by a companion of Amerigo Vespucci, and in which existed a perfect society. In this happy island all the property belonged to the commonwealth, to which every one contributed by his labour and received therefrom a supply of his wants. Its penal code was of wonderful mildness (in striking contrast to that which prevailed at that period in England), and still more wonderful, the people had learned to tolerate diversity of opinion in religious matters. Promotion also was according to merit, and the citizens rose through all the gradations of their existence from form to form, as in a great public school. The wisdom of the book was far in advance of its age, and in perusing its pages it is curious to note how that many of the practices of Utopia have since spread to Great Britain and other civilized countries. "Utopia" was published in Latin in 1516, and translated into English by Bishop Burnet. It attained a wide popularity, its name furnishing the familiar epithet "Utopian," which is commonly applied to projected reforms in religion, government, or society. It is hardly too much to say that all the great changes for the better, which have taken place in either of these spheres of human life, have had to pass through their Utopian stage; nor is it too much to hope that many of the reforms yet to be desired, but which are now considered Utopian, may in due time be actually realized.

**UTRAQUISTS** (Lat. *utraque*, in both kinds), one of the two great sects of the Hussites, the other being the Taborites. The Utraquists were also called Calixtines (Lat. *calix*, a cup), because they chiefly differed from the orthodox church on the question of the cup being reserved to

the priest alone in the Lord's Supper. This point being yielded them in 1433 by the Council of Basel, and the use by the laity of the cup as well as the wafer permitted, they returned to the church. For this the Taborites attacked them in arms, but were defeated by the Utraquists in 1434. The Emperor Sigismund confirmed the council's action, and was in consequence elected by the now dominant Utraquists as King of Bohemia; but as soon as he felt himself to be firmly established on the throne he endeavoured to restore the Catholic worship according to the strict Roman rite. He did not succeed, but a great deal of trouble was caused by his breach of faith.

The word Utraquist is often met with in descriptions of certain places in Bohemia and Moravia. It has now, however, no reference to the religionists of the past, no traces of whom remain; it simply signifies that in those places both languages (Czech and German) are spoken.

**UTRECHT**, a town of Holland, the capital of the province of the same name, is situated at the point of divergence of the Oude Rijn and the Vecht, and had 71,337 inhabitants in 1881. The Rhine divides the city into two parts, and there are likewise two canals with thirty-six drawbridges. The site is dry and rather elevated, with a descent towards the river. The approaches to the city are very beautiful, especially that from Amsterdam, which consists of a broad avenue, bordered with rows of trees. Many wealthy Dutch families reside in and near the town. The appearance of the city itself is antique, many of the houses being in the Gothic style. It is surrounded by a ring of forts, but the ramparts have been converted into public walks. There is a magnificent walk called the Maliebaan, above a mile in length, planted with eight rows of lime trees. The cathedral was formerly a fine edifice, built about 720. In 1674 a hurricane destroyed the body of the building, and only the choir, transept, and tower remain; the last is wholly detached from the other parts, leaving room for a wide street on the place once occupied by the nave. The only part of the building at present in use is the choir, fitted up in a plain manner for the Presbyterian service, though it has some fine monuments. The tower is 388 feet high; from it in clear weather may be seen nearly all the Netherlands. There are the state mint and numerous churches and charitable institutions. The town-house is a handsome modern building. The university has faculties of languages, mathematics, medicine, theology, and law; attached to it are a good library, botanic garden, and an observatory. In addition to the university there are some scientific societies, and a large number of admirable schools in the city, and education generally stands very high. The inhabitants manufacture woollen cloths, silk, lace, and needles, tobacco and cigars, salt, furniture, baskets, rope, and tin, copper and silver. There are also some saw-mills, iron-foundries, and extensive printing establishments. In addition to its manufactures the town has a good trade in grain and cattle. It has excellent water communication, and is also the centre of several lines of railway, which radiate to all parts of the Netherlands. The town is the seat of the provincial government and of civil and military superior courts.

Utrecht was called by the Romans *Trajectum ad Rhenum* (ford on the Rhine), and in monkish Latin *Ultra Trajectum*, whence comes its modern name. The first Bishop of Utrecht was St. Willebrod, an Englishman, who left his own country, in the seventh century, to convert the Heathen Frisians, who then possessed the land. He baptized many thousands of them; and the Pope ordained him bishop over them, while Charles Martel presented to him the Castle of Utrecht for his residence, and the surrounding district for his see. The town was the birthplace of Adrian Floriszoon, tutor to Charles V., bishop of Utrecht, and afterwards Pope Adrian VI. In the audience-hall of the university, in 1579, was signed

the act of confederation, declaring the Seven United Provinces independent of Spain; and in the British minister's house, now replaced by a barrack, the treaty of Utrecht was signed in 1713, which ended the War of the Spanish Succession. For a short time, in 1807, the town was the residence of Louis Napoleon, king of Holland.

Utrecht is the headquarters of the Jansenists, a sect of dissenters from the Roman Catholic Church who object to the bull of Pope Alexander VII., condemning as heretical certain doctrines of Jansenius, bishop of Ypres. They scarcely exist in any number, except in Holland, where they are now reduced to 5000. Utrecht is the see of their archbishop.

**UTRICULARIA** is a genus of plants belonging to the order LENTIBULARIÆ. About 150 species are known, growing in water in most parts of the world. Three species are British. The Common Bladderwort (*Utricularia vulgaris*), which may be taken as typical of the genus, is a small floating aquatic plant, with a much-branched submerged stem, and finely divided hair-like leaves. The flowering stems rise out of the water to a height of from 4 to 6 inches, and bear clusters of delicate yellow flowers. The latter have a two-parted calyx and a two-lipped personate spurred corolla. Interspersed among the leaves and branches are numerous minute membranaceous bladders, green in colour. The bladderworts are insectivorous, or more properly carnivorous plants, feeding on animal matters by means of these bladders. The bladder is fitted with a valve or lid, which only opens inwards, and thus forms a trap in which water-insects, small crustaceans, and even the fry of fishes get entangled. No true process of digestion takes place, as in some other carnivorous plants—the sundew and the Venus fly-trap, for instance; but the wall of the bladder is covered with small glands and prickly hairs, which absorb the animal matter when decomposed. These glandular processes are all directed backwards, and so probably serve also to retain the prey when caught. The fry of roach have been seen entangled in these singular traps. See the article INSECTIVOROUS PLANTS in the present work, and also Darwin's work under that title.

**UTRICULUS**, the classical name for the BAGPIPE. It is also the name given, on account of its form, to the larger of the two tiny sacs filled with fluid, and situated in the vestibule of the inner ear. The membranous semi-circular canals open into the utriculus. The utriculus contains a small quantity of a sort of calcareous ear sand (otoliths), the function of which is not yet clear. See EAR.

**UTTOXETER**, a market-town of England, in the county of and 14 miles N.E. from Stafford, and 135 miles N.W. of London by rail, stands on rising ground near the Dove, which here separates Staffordshire from Derbyshire, and is crossed by a handsome stone bridge. The eight principal streets diverge from the market-place, and the houses are generally well built. The church has been rebuilt, but the ancient lofty tower and spire remain. The chancel was extended in 1877. There are several Dissenting chapels. The free grammar-school is of good repute. It was rebuilt in 1859. The town has an excellent town hall, news-rooms, and a mechanics' institute. There are large iron-works in the neighbourhood, and malting, tanning, nail-making, rope and twine spinning are carried on. Owing to the fertility of the surrounding country, especially the excellence of the pastures along the Dove, the market held here for agricultural produce, cattle, and sheep, is one of the best in the country. There are some large and flourishing breweries in the town, and a good trade in wool, malt, and bricks. Population of the parish, which includes some neighbouring hamlets, 4981. Uttoxeter was known to the Romans as *Utlacaster*.

**UVA** is a genus of plants of the order ANONACEÆ, so named from Lat. *uva*, grape, the fruit of some species

growing in grape-like bunches. The species are numerous, natives chiefly of India and the Indian islands, with a few in Africa. They are all climbing plants, covered with star-shaped hairs. Some are medicinal plants. The roots of *Uvaria Narum* are fragrant and aromatic, and are used in India in intermittent fevers and certain diseases of the skin. A fragrant oil is obtained from them by distillation. The leaves of *Uvaria triloba* are used for boils and abscesses and the seeds as an emetic. *Uvaria zeylanica*, a native of Ceylon, with scarlet starry flowers, has edible fruits.

**U'VULA** is the small cylindrical body which hangs at the middle of the posterior margin of the soft palate. The soft palate is peculiar to man's own order and the crocodile. The uvula is almost confined to man himself. It is covered by a continuation of the mucous membrane of the palate, and contains in its interior some minute glands, and a muscle which has the power of elevating and shortening it.

**UX'BRIDGE**, a town of England, in Middlesex, 16 miles W. of London by rail. The town stands on the eastern side of a branch of the river Colne, and consists of one principal street, about a mile in length, along the Oxford road, and two or three smaller ones. There are in the principal street two bridges over the arms of the river Colne, and one over the Grand Junction Canal. In the neighbourhood are some handsome villas. There are several churches and places of worship for dissenters. The corn market is held on Thursday, and is very large. A corn exchange was erected in 1861. The town has also a good trade in timber, slate, and coal, and brick-making is

extensively carried on. Population of the town, 7869. The unsuccessful negotiation between Charles I. and the Parliament in 1644, took place at Uxbridge in an old brick building called the "Treaty House," which has been converted into an inn.

**UZ'BEGS**, a people of Turkestan, belonging to the Turkish or Tartaric branch of the Turanian race, of which they are the most civilized tribe in that country, and constituting the dominant native population in Khiva, Bokhara, and Khokan. By Meyendorff their numbers were estimated at 1,500,000 persons, and Vamberg distributes them into thirty-two tribes, of which the chief are the Ming, the Jagatais of Namaghan, and the Kurumas on the river Sir. The typical Tartar characteristics of the Kirghiz are modified in the Uzbeqs, probably by the introduction of our Aryan element. They are tall, muscular, and well formed, ruddy in complexion, with broad noses flattened at the end, receding foreheads, and but little beard. Although many of the Uzbeqs still live as nomads, the larger number belong to the class known as Sarts, or settled inhabitants of Turkestan, and dwell in or about the principal towns, where their military, official, and social influence has induced many persons of different race to assume their name. In the time of Timur, about the end of the fourteenth century, the Uzbeqs dwelt north of the Jaxartes, whence they subsequently overran Bokhara. The purest specimens of the people are met with in Khokan. They are to a man fanatical Mohammedans, but during recent years they have been compelled to submit to Russia, and to acknowledge the authority of the White Czar as supreme over Bokhara, Khiva, and Khokan.

## V

**V**, as pronounced by the English, is the flat or sonant spirant labial, bearing the same relation to *f* that the mute labial *b* does to *p*. Its form is only a variety of the character by which the vowel *u* is denoted, the latter being in its origin the cursive character employed with soft materials, while *v* is better adapted for writing on stone. It was in origin a hook in all probability, and in fact the Hebrew name for it is *Vav*, hook. The Roman letter *v* was probably pronounced as a *w*, a supposition which would explain the fact that in the alphabet of that language one character is employed for both *u* and *v*. The converse of this appears in the German alphabet, where *w* has nearly the power of *v*, while the latter symbol is used to designate the sound of the English *f*.

**V** is interchangeable with *b* and *m*, as Lat. *caballus*, Fr. *cheval*; Lat. *sapientem*, Fr. *sarou*; Fr. *muloisie*, Eng. *mulesey*, &c. It is also interchangeable with *f* (as Lat. *vicus*, Fr. *rif*; Lat. *borem*, Fr. *boisf*, &c.; see also Eng. *fox*, vixen; five, fifty, &c.), and hence the confusion between the characters *f*, *r*, and *w*. Periwinkle has a *w* for the *r* in Fr. *perceuche*. It also changes with *g* sometimes, as Lat. *respa*, Fr. *guêpe*; Lat. *sergentem*, Fr. *sergent*. And it is frequently omitted, as Lat. *paronem*, Fr. *paon*; Lat. *virenda*, Fr. *viande*, &c. As a Roman numeral it stands for 5, but in this case the symbol is only by accident the same as that for the letter *V*, with which it has not the remotest connection. It is simply an expression of the five fingers of the open hand, the thumb stretching away in a V-shape from the other fingers. In like manner 10 is expressed by two *V*'s, one reversed and beneath the other, X shape.

**VACCINATION** (Lat. *vacca*, a cow) is the process by which the human subject is inoculated with the material of vaccinia, or the cow-pox, with the view of protecting the individual against an attack of small-pox. The ravages

of the latter disease before the introduction of vaccination have been noticed under **SMALL-POX**, and an account of the discovery that cow-pox when communicated to man rendered him as unsusceptible to an attack of small-pox as an attack of small-pox itself did, together with the fact that cow-pox might be continued from individual to individual by successive transmissions, has been noticed under **DR. JENNER**.

There is good reason for supposing, though the point is not fully established, that vaccine is simply the infectious matter of small-pox modified by passing through the body of the cow or the horse; but however this may be, it is certain that cow-pox never occurs spontaneously in man, nor is it communicated by effluvia or in any other way than by the direct inoculation of its own specific virus.

There are several different methods of performing the operation of vaccination, the essential point in each being the introduction of the vaccine lymph to the circulation. The spot generally selected is the outside of the arm just below the shoulder, and here four or more insertions are made. Some surgeons puncture the skin in small straight cuts with a sharp lancet well charged with lymph, others make a number of parallel or crossed scratches with a charged lancet, while Dr. Seaton, who was the medical officer to the Local Government Board, and one of the chief authorities on this subject, recommended as the most effective method the plan of scarifying or tattooing the spots selected with a number of small punctures, over which the lymph should be spread with the flat part of the lancet. He further advised that where the vaccination was done on both arms there should be three insertions on each, while if it was confined to one five insertions should be made on that arm. In the ordinary way, after the lymph is inserted no particular effect is observed till about the end of the second day, or early on the third day, when

the skin at the spot becomes slightly elevated, hard, and red. This elevation by the fifth day has become a distinct vesicle, bluish-white in colour, with a raised edge and central cup-like depression. It is distended with clear lymph, and by the eighth day (the day week from that on which the lymph was inserted) it attains its full development; the vesicle being plump, round, more decidedly pearl-coloured, the margin being firm, and the central depression very marked. On this day, and sometimes a little earlier, a ring of inflammation, called the areola, begins to form about its base, and both vesicle and areola continue to spread for the next two days. After the tenth day the areola begins to fade, the pustule commencing also to dry in the centre, until by the fourteenth or fifteenth day a hard brown scab is formed, which usually falls off about the twenty-first day, but which may remain a day or two longer. It leaves a cicatrix, which is commonly permanent in after-life, circular, somewhat depressed, generally dotted or indented with minute pits, and in some instances radiated. The constitutional symptoms are usually a slight rise of temperature, increasing to obvious feverishness, with derangement of the stomach and bowels, between the eighth and tenth day, and occasional swelling of the glands of the armpit, these symptoms subsiding as the areola fades and disappears. Sometimes slight skin eruptions also appear when the areola is at its height; but these, together with the general symptoms, are usually slight in intensity, and seldom call for special treatment. While the punctures are healing there is a good deal of itching, and it is a good plan to cover them with a soft piece of clean linen, thickly spread with cold cream, which may be kept in its place by means of a layer of cotton wool and a suitable bandage.

With respect to the time at which the operation should be performed, Dr. Seaton observes:—"Small-pox being a disease to which persons are liable from the moment of birth, and which is peculiarly fatal in infancy, it is of great importance that vaccination should be performed in very early life." Plump and healthy children should be vaccinated when a month or six weeks old; more delicate children may properly wait three or four weeks more; but all, except where the state of health positively contra-indicates vaccination, should be vaccinated by the age of three months. The lymph for vaccination should be taken from primary cases only, from perfectly healthy subjects, and from thoroughly characteristic vesicles. Those of dark complexion, not too florid, with a thick, smooth, clear skin, generally yield the best and most effective lymph. The best time to take lymph is usually the eighth day, but the vesicle must be uninjured and free from areola. The latter circumstance is important, and of still greater importance is the rule to reject all lymph with which even the slightest quantity of blood has been drawn. Lancets used for vaccination should be kept bright, should never be used for any other purpose, and if used for more than one vaccination at a time they should be most carefully cleansed after each case.

In the early days of the vaccination movement it was supposed that the operation, when properly performed, would protect the subject against small-pox for life, though Dr. Jenner never claimed for it more protective power than that afforded by an attack of the disease, and it is known that persons may have more than one attack of the small-pox; but subsequent experience has shown that in the majority of cases re-vaccination about the age of twelve years is necessary, and that it may be desirable to resort to it afterwards whenever there is any special danger of infection. In small-pox hospitals it is customary to vaccinate the nurses, whether they have been previously vaccinated or not, before they enter upon their duties, and many doctors submit to the operation whenever they have to combat an epidemic of the disease, the immunity of

both doctors and nurses being most remarkable. With respect to the value of vaccination as a protective against small-pox the defenders of the practice, in which are included the vast majority of the medical profession, Continental and American as well as British, contend that it is manifested in two ways; first, by the immunity from the disease which, as a rule, it confers; secondly, by the modification which, when immunity is not complete, it induces in the course and severity of the disease in the majority of cases. Statistics derived from the experience of the small-pox hospitals of London show that while the disease runs an unmodified course in all but 2·6 per cent. of the unvaccinated patients, its course in vaccinated patients is modified in 73 per cent.; and that while the death rate of natural small-pox is 35·55 per cent., that of post-vaccinal small-pox is not more than 8 per cent. The difference between 35 and 8, however, does not give a fair idea of the protection afforded by vaccination, as in many cases the vaccination was proved to have been of a very imperfect character. Statistics recently collected of 11,724 cases of small-pox treated in the hospitals of the Metropolitan Asylums Board showed that in 4177 cases having good marks there were 188 deaths: mortality per cent. 4·1; in 7247 cases having indifferent marks the mortality was 799, or at the rate of 11·0 per cent.

The chief dangers attending vaccination are the occurrence of erysipelas, which may supervene upon this, as on any other surgical operation or other injury, and the possibility of conveying other disease, notably syphilitic infection, along with the vaccine. Against the former it is only necessary to consider the condition of the patient before operating, and to guard the place of operation against the entry of dirt or decomposing matter. The latter danger, though real, is of exceedingly rare occurrence, but the following precautions should always be observed in order to prevent its possibility:—(1) Extreme care in choosing a subject from which to take lymph; (2) strict cleanliness in every instrument used; (3) scrupulous care in taking lymph not to draw any blood; and lastly, care to avoid any vesicle in which there is an areola, and in which therefore the normal contents have become mingled with the products of common inflammation. During recent years the practice of obtaining lymph direct from the calf has gained some ground, but the advantages or disadvantages of the practice are not as yet fully ascertained. The constitutional symptoms attending the rise of calf lymph are, as a rule, much more severe than those where human lymph is employed.

The law as to vaccination is now governed by 30 & 31 Vict. c. 84, which repealed all former Acts, and came into operation on 1st January, 1868, and which was amended by 34 & 35 Vict. c. 98. These Acts provide for the appointment and payment of public vaccinators throughout the kingdom, and for the due registration of the operation. They also enact that all children born in England must be vaccinated within three months of their birth, under a penalty of 40s., unless any public vaccinator or medical practitioner certifies that any such child is not in a fit state to be vaccinated. This certificate lasts in force only two months, but it may be renewed if necessary. In Scotland the limit of age is six months. The payment of the penalty does not release the parent or guardian from compliance with the law, and it may be enforced at due intervals until obedience is secured.

In conclusion, it remains to be noticed that in recent years a strong anti-vaccination movement has arisen in England, and that this has in several instances induced wholesale disregard of the vaccination laws. The case of the opponents of vaccination may be briefly outlined as follows:—Against vaccination itself it is urged that statistics show that it does not afford protection against small-pox; that it does not mitigate the disease when it is incurred;

that the practice is in itself one of great danger to health and life, frequently conveying serious disease, and often directly causing death; and lastly, that the decrease of small-pox in modern times, due in itself to improved sanitation and treatment, has been retarded by the use of vaccination. It will be seen that these arguments directly contradict the views we have noted as obtaining the support of the majority of the medical profession, but they are defended with much earnestness, and there is already an extensive literature upon the subject. As against the enforcement of vaccination by law, they contend in brief that (1) vaccination either protects against small-pox, or (2) mitigates it when it is incurred; or (3) does neither of these things. Now if it neither protects nor mitigates, it is useless, and ought not to be enforced. If it only mitigates, since the mildest small-pox is as contagious as the more severe cases, vaccinated small-pox is as dangerous to the community as unvaccinated, and therefore there is no reason for enforcing vaccination by law. If on the other hand it be contended that vaccination does protect, then let those who believe in it obtain the protection and be satisfied with it without compelling others, who cannot endanger them, to undergo the operation against their will.

The movement has, up to the present, found its greatest success in the towns of Keighley and Leicester, where the anti-vaccinators are in the majority, and where the law is practically defied. Every year the number of unvaccinated children in these towns increases, and though the experiment is a very hazardous one, should it be prolonged it may throw additional light upon the subject.

**VACCINIA CEE** is an order of plants belonging to the group Gamopetalæ, cohort Ericales. This order is very nearly allied to the order ERICACEÆ, from which it is chiefly distinguished by the inferior ovary and succulent fruit. The species are numerous, natives of temperate climates in all parts of the world, and found also in high mountain-chains within the tropics. They are shrubs or small trees with alternate, exstipulate, often evergreen leaves. The flowers are solitary or clustered; the calyx is adherent, entire, or four or five toothed; the corolla is epigynous, generally urn-shaped or bell-shaped, four to five-toothed or five cleft; the stamens are eight to ten, epigynous, with two-parted anthers opening by pores. The fruit is a fleshy berry, surrounded by the teeth of the calyx.

The properties of this order closely resemble those of Ericaceæ. The bark and leaves of many of the species possess astringent properties, and are slightly tonic and stimulating. The fruit of many of the species possess acid and saccharine properties, and are used as articles of diet under the names of Bilberry and Whortleberry. See VACCINIUM.

**VACCINIUM** is a genus of plants, the type of the order VACCINIACEÆ. The species are low-growing heath-like shrubs, chiefly natives of temperate regions in both parts of the world. About 100 species are known, three of which are found in Britain. The Bilberry or Whortleberry (*Vaccinium Myrtillus*) is found in stony woods and heaths in Britain. It is an erect shrub, about a foot high, with angular branches and deciduous ovate serrate leaves, which turn red in autumn. The flowers are solitary, somewhat globular, greenish, tinged with red. The globular black berries are used in preserves, tarts, &c. The Bog Whortleberry (*Vaccinium uliginosum*) is found in mountainous bogs in Cumberland and Westmorland, but more frequently in the Highlands of Scotland, and nearly on the summits of the highest mountains. Its berries are very similar to those of the bilberry, but their flavour is not so agreeable. It is a native of Iceland, and the inhabitants gather its leaves, with those of *Lycopodium alpinum*, in order to procure a yellow dye for colouring woollens. It is distinguished by the ovate, entire, glau-

cous leaves, and by the flowers being several together, ovoid and flesh-coloured. The Red Whortleberry or Cowberry (*Vaccinium Vitis idæa*) is a low straggling shrub, with evergreen leaves and pale flesh-coloured flowers, arranged in terminal drooping clusters. It is a native of dry places on heaths, mountains, and in woods throughout Europe. It is plentiful in the north of England, Westmorland, Derbyshire, and Wales. The berries are red, and possess acid and astringent properties. They are hardly eatable in a raw state, but are made into pies in Derbyshire, and eaten by the common people. The leaves and stems are used for dyeing yellow. Several species are found in the United States, where the fruits are gathered for the table. Some exotic species are also cultivated in this country as ornamental shrubs.

**VACUUM** or **VOID**, the name given in physics to space wholly free of matter, or perfectly empty. In the common phrase space is called empty when, so far as air can fill space, it is full of air; and even in a more scientific form of speech, there is said to be a vacuum when there is such an approach to a vacuum as the operations of philosophy can procure. But in the "vacuum" of the air-pump, however long the attempt at exhaustion may be continued, there is always air left, though in a highly attenuated state; and even in the mercurial vacuum, or in the space which is left over the mercury of the barometer, there is not unfrequently a slight portion of air, and always an atmosphere of the vapour of mercury. Physically speaking, it is probably impossible to procure a vacuum: it is most likely that, even if a real vacuum could be procured for an instant, air or other vapour would at once begin to be disseminated from the sides of the vessel in which it was made, and that it would thus instantly cease to exist.

But the question of the existence of vacuum, in its strict and absolute sense, and as to whether it is or not possible for a vacuum to exist, has been a subject of controversy from the earliest days of philosophy.

Descartes denied the very possibility of a vacuum. There is in his writings an absolute and palpable confusion between *space* and *matter*, to the extent of an assertion that the destruction of all the matter in a certain space would be the destruction of the space itself.

Probably the manner in which the reader is most familiar with the use of the word is in connection with the maxim "Nature abhors a vacuum," a doctrine which, though common among the followers of Aristotle, must not, any more than many others, be taken as emanating from that philosopher himself. This is usually cited as a proof of the pericily of the ancient and middle philosophy—we think somewhat unjustly. The personification of nature is common to all times, and we are in the habit of saying that nature exhibits phenomena, conceals her operations, uses the simplest means, &c. As the statement of a fact, it is true: nature *does*, to the best of our knowledge, abhor a vacuum; she (if we may personify her) never suffers it to exist to the extent of allowing any space which is perceptible to our senses to be vacuums.

**VAGRANT** (Lat. *vagari*, to wander), a term probably introduced into our law language from the Norman-French, and which may be defined as one who wanders about without any settled home, refuses to work, and has no means of subsistence.

The evil of vagrancy is one which has infested English society from an early period, and, as we have narrated under POOR LAWS, various statutes and ordinances have been passed to obviate the inconveniences arising from wandering mendicancy. The law now existing is contained in the 5 Geo. IV. c. 38, as amended by the 1 Vict. c. 38, 7 & 8 Vict. c. 101, 8 & 9 Vict. c. 10, and 34 & 35 Vict. c. 108. Another Act passed in 1873 considerably enlarged the 5 Geo. IV. c. 38, by extending the latter Act

to gaming with coins, cards, tokens, or other articles in any public thoroughfare. For such gambling in the streets—"pitch and toss," &c.—persons may be at once prosecuted as rogues and vagabonds, and may be imprisoned under the 5 Geo. IV., or fined 40s., and for a subsequent offence £5. By the 34 & 35 Viet. c. 108, casual vagrants who apply at workhouses for relief may be detained until eleven o'clock in the morning, the object being to afford ample time for the performance of the respective labour tasks. Casuals leaving the ward refusing to do the prescribed task, or making a false statement for the purpose of obtaining relief, are liable to imprisonment.

The effect of the last-mentioned Act has been to reduce the number of vagrants applying to the workhouses for casual relief, but it has not diminished the number of such persons at anything like the same rate. During the summer months large numbers of them pass the night in the open air in preference to using the casual ward, and, in London, Trafalgar Square and the Thames Embankment are recognized rendezvous.

The vagrants of the present day are made up of hereditary and professional beggars, persons who have been brought up in workhouses and who have relapsed into beggary, discharged soldiers of bad character, broken-down and dissipated workmen, with a sprinkling of gentlemen and members of the middle classes who have gone to the bad. As a class they are chiefly noted for their hatred of work—a hatred which in some cases becomes almost a mania—their indifference to dirt, and their insatiable thirst for alcohol. They are generally ready to pilfer, or to extort money from women and timid or defenceless men, but as a rule they have neither the courage nor skill in crime possessed by the regular professional criminals. Every now and again, however, communities are horrified by some abominable outrage of rape or robbery with violence perpetrated by vagrants or tramps, who in too many cases succeed in eluding justice. Among themselves they practise mutual fellowship, readily imparting information as to police regulations, workhouse rules, and suitable places for begging, and occasionally go so far as to share with each other their stores of provisions, tobacco, or drink, but to workhouse officials and police they bear, as might be expected, a bitter enmity. "Wandering about with no purpose except wandering, with no restraint except hunger, no hope except of getting drunk upon some lucky haul, nomads in the midst of civilization, simple savages without savage resources," the regular vagrants and tramps form a class by themselves, and in spite of remedial measures and repressive laws, both of which are imperatively necessary, it is to be feared that it is hardly possible to do more than restrain them in their efforts to prey upon society.

**VAHEA** is a genus of plants of the order *AROCYNACEÆ*. There are four species, natives of Madagascar and Western Africa. *Vahea madagascariensis* and *Vahea grandiflora*, from Madagascar, yield an abundance of caoutchouc or INDIA-RUBBER, which, though not yet exported for commercial purposes, is said to be of excellent quality. The species are tall shrubs or trees, with opposite leaves, and dense terminal clusters of large white flowers.

**VAIR**, an antique fur, now obsolete, but favourite with our ancestors, and made of the coat of a kind of squirrel. This is the *vair* of heraldic usage. This, so says M. Littré and very many learned men, is also the *verre* (glass) of Cinderella's slipper. According to Littré, Cinderella probably wore silk slippers trimmed with *vair*; but as *vair* had died out, later printers, not knowing the word, imagined it to be an antiquated mis-spelling of *verre*, and altered the text of the story accordingly. The absurdity of a glass slipper is manifest, yet nothing is impossible in a fairy story, and perhaps Perrault did mean glass and not fur to be worn by his heroine. The auditors of the

nursery never seem to hesitate at the curious vitrified *chaussure* which so perplexes their seniors.

**VAIS'ESHKA**, one of the two divisions of the Nyaya philosophy of the Hindus. It contains the foundation of the atomistic (*vaisheshika*) theory.

**VAISHNA'VAS**, the more numerous of the two great sects which divide the Brahmanic religion of India, the other being the Saivas. The peculiarity of the Vaishnavas is that they hold Vishnu to be the paramount god, because, they argue, Siva represents annihilation, and in annihilation there are no degrees. Vishnu, on the contrary, as preserver of life and giver of rewards, implies a higher and a lower, has the superiority of variety, and is capable of attaining any height of glory.

**VAL D'ARNO BEDS**, in geology, a series of deposits which have filled up a lake in the upper part of the valley of the Arno, in Northern Italy, about 10 miles above Florence. They occupy an area of about 21 square miles, and are of great interest to geologists and palæontologists on account of the number of bones they yield of the animals inhabiting that part of Europe in the *PLIOCENE* period. Among these fossils are an elephant (*Elephas meridionalis*), a rhinoceros (*Rhinoceros etruscus*), a hippopotamus (*Hippopotamus major*), bears, hyænas, and the earliest known remains of a true horse (*Equus stenonis*). Many of the same animals have left their remains in the so-called forest bed of the Norfolk coast.

**VALAIS** (*Wallis*), a Swiss canton, consists of the basin of the Rhone from the source of that river to the Lake of Geneva. A small portion of this basin, however, which lies on the right bank of the river between the Dent-de-Morcles and the lake, belongs to Vaud. The canton has been described as an immense trough, 70 miles in length,  $1\frac{1}{2}$  mile in depth, and 2 miles wide at the bottom. The mountains on either side—the Pennine and Bernese Alps—are among the highest in Europe, and the canton is exposed to furious torrents and destructive avalanches.

*Physical Aspect, Products, &c.*—The area is about 2000 square miles, of which more than one-half consists of high alps and glaciers, and the remainder of lower offsets and intermediate valleys. The heat in the summer is very great in the valley, especially in the neighbourhood of Sion and Sierre, where the fig, mulberry, almond, and pomegranate, thrive in the open air. The vine, Indian corn, barley, and potatoes are cultivated. Walnut, chestnut, cherry, apple, and pear trees are abundant. In several localities excellent wine, both white and red, is made, and cider in other districts. Cattle rearing is the chief branch of industry, but in ordinary years the crop of corn is sufficient for the consumption. The forests are extensive: great quantities of timber are cut down, and sent by the Rhone into France. Mines of iron, copper, lead, silver, cobalt, and zinc have been found. Goitre and cretinism are very common in this canton. There is little manufacturing industry in the country, and the population, generally, is much poorer than that of the Bernese Oberland. There is a somewhat active transit trade, as the Valais opens into the Lake of Geneva, and is also connected by great high roads and a railway with other parts of French Switzerland. The sublime Pass of Gerni connects the eastern part of the valley with German Switzerland, and the Great St. Bernard and Simplon with Italy. The inhabitants of the Bas-Valais are chiefly of French, and those of the Haut-Valais of German descent, and their language varies accordingly. Their number in 1880 was 100,216—all Roman Catholics.

**VAL'DAI HILLS**, the only range of European Russia, form a series of low plateaus, extending S.W. to N.E., through parts of the governments of Vitebsk, Smolensk, Pskov, Tver, and Novgorod, rising in Popova Gora to 1150 feet, but generally about 800 to 900 feet in height. With their continuations in marshy uplands, north-east towards the



Urals and south-west to the frontiers of Poland, they form the great watershed of the country. They are composed of old red sandstone and carboniferous limestone, and rise so gradually that the railway from St. Petersburg to Moscow is carried across them, passing near the small town of Valdai.

**VALENCE**, a town of France, in the department of Drome, situated on the left bank of the Rhone, 56 miles S. of Lyons, in a rich vine district. It has a cathedral, rebuilt at various times, but with parts dating back to the eleventh century, an artillery school, where Bonaparte studied in 1785, a library, and a theatre. The reeling and throwing of silk affords employment to a large number of persons. The population in 1886 was 21,808. Valence was anciently the capital of the Segalauni, and became a Roman colony under Vespasian, but it possesses no Roman antiquities. It formed successively part of the kingdoms of Burgundy and Arles, and of the dominions of the counts of Provence and Toulouse: it subsequently became the capital of the Valentinois, and was governed by its own feudal nobles till ceded to Louis XI., in 1449. From the fourth to the thirteenth century eight church councils were held in Valence. Protestantism took root here from the first; so that in the religious wars the Barons des Adrets made it his headquarters, after slaying the Roman Catholic governor at his own door. Here, also, Pitt's VI. died a prisoner, 1799, at the Hôtel du Gouvernement.

**VALENCIA**, a province of Spain, is bounded E. by the Mediterranean, S. by Murcia, Alicante, and Albacete; W. by Albacete and Cuenca, N.W. by Teruel and the Sierra de Albarracín, and N. by Castellón. Until the year 1832 Valencia was called a kingdom, having once formed part of the dominions of the crown of Aragon; but it was then divided into three provinces, Valencia, Castellón de la Plana, and Alicante. A large proportion of the surface, particularly in the north and west, is mountainous, but the plain country, which stretches along the coast, and is well watered by the rivers Xucar, Guadalaviar, and Segura, is one of the most fertile and best cultivated districts in Europe. The plain or vega of Valencia is about 30 miles long and 20 wide: on three sides it is bounded by the mountains of Segura, and on the fourth by the sea. The whole of this vast extent is known as the *Huerta*, or Garden of Valencia, and is planted with olive, mulberry, ilex, algarroba, orange, and palm trees. Such is the fertility of the soil that two and three crops are generally obtained in the year. Rice is the most valuable product, and is chiefly grown in the tract which is irrigated by the ALBUFERA, a large lake in the neighbourhood of Valencia. The exports of raisins, barilla, almonds, figs, oranges, oil, saffron, wool, brandy, and wine, from different parts of Valencia, are very great, particularly a wine called Beni Carlo, which comes from a town of that name. Much of this wine is sent to Bordeaux to impart body and colour to the clarets.

Mercury, copper, sulphur, arsenic, gold, silver, lead, iron, coal, and antimony are among the mineral products. Cordage made from the fibre of the esparto grass, mats, flooring tiles, soap, glass, paper, pottery, and earthenware, are sent to all parts of Spain. Salt is also largely exported.

The area of the kingdom of Valencia in 1832 was 7651 square miles, and the population 957,104. The area of the present province is 4352 square miles, and the population at last census was 679,046. The dialect spoken, though much akin to the Catalanian, differs considerably from it, as it retains more of the Provençal. The inhabitants, who are chiefly of Moorish descent, are more industrious than those of any other part of Spain, except Catalonia. Valencia was first colonized by the Phœnicians or Carthaginians, who had established many flourishing settlements in it, when it was wrested from them by the Romans. Under the latter it made great progress in civil-

ization, and was one of the most tranquil provinces of the empire, when it fell a prey to the Goths. About the beginning of the eighth century the Saracens became its masters. In the eleventh century it was erected into a separate Moorish kingdom, under the dynasty of the Agherides, and retained its independence till 1238, when Don Jayme I., availing himself of its civil dissensions, completely subdued it, and incorporated it with his own kingdom of Aragon. It afterwards passed to the crown of Castile, but continued to preserve its representative body and its privileges till the early part of the eighteenth century, when, having taken part against the Bourbon dynasty, it was, on their establishment on the throne, deprived of its old constitution, and obliged to conform to the laws of Castile.

**VALENCIA DEL CID**, a city of Spain, capital of the above province, 194 miles E.S.E. from Madrid by railway, stands in a wide plain called *La Huerta*, or "the Garden," about 4 miles from the mouth of the Guadalaviar, which washes its walls and separates it from its suburbs, with which it communicates by five stone bridges of from ten to thirteen arches. Valencia was a city of some importance under the Romans. The Moors captured it in 712, and the town was annexed to the Empire of Cordova till about 1056, when, for a short time, it and its dependent territories formed an independent kingdom. It was taken after several months' siege, about 1088, by the famous Cid Rodrigo Diaz de Bivar, from whom the city takes its surname *del Cid*. The Moors, however, soon compelled the Cid to evacuate the town, of which they remained masters till 29th September, 1238, when it was finally taken from them by Jayme I. of Aragon. Valencia was captured by the French under Suchet in 1812, and held by them till June, 1813.

The city is nearly circular, and about 2½ miles round; it is inclosed by massive walls built by the Moors, flanked at intervals by round towers. There are eight gates; that of the Cid is very remarkable for its architecture. The new thoroughfares are wide and well paved, and the houses lofty and painted with such colours as offer the least attraction to the rays of the sun. The best of them have courts freshened with flowers and cooled by fountains. The city is furnished with public sewers of great solidity, which are said to be the work of the Romans. The cathedral, built on the site of a temple of Diana and a Moorish mosque, is of mixed architecture, with a very lofty tower called "el Miquelete," from the top of which a commanding view of the whole Huerta is obtained. The cathedral contains numerous richly-decorated altars and paintings by Valencian artists. The church of the Colegio de Corpus and some picture galleries also contain several excellent specimens of the great Valencian school. The exchange, a palace built by Charles III., the archbishop's palace, the college of Pius V., and several noble residences, are worthy of notice. There is also a theatre, various hospitals, and numerous churches. The university, founded in 1411, is one of the most frequented in Spain; it was formerly famous for the study of medicine. The magnificent library attached to it was entirely burnt by the explosion of a shell during the Peninsular War: another library has since been formed with the books of the suppressed convents, as well as a gallery of paintings and sculpture, collected from the various religious houses in the province. Besides the university there are several colleges and many inferior academies. The city is the see of an archbishop, the residence of a captain-general, and has a supreme court of justice. The population of city and suburbs is 113,000; that of the city alone, about 90,000.

Valencia has very good facilities for bathing, and being in direct railway communication with the capital, is visited by large numbers of Madrilenos during the summer months. The climate, though hot, is agreeable and healthy. The city has good quays, faced with stone, and lined with trees.

The port of Valencia is at Grao, about 2 miles further down the Guadalaviar. It is connected with the city by a broad planted avenue. From the sea the city has quite an Oriental appearance, in consequence of the number of domed churches and campanies. The harbour was formerly suitable only for boats, but it has been much improved, and can now afford accommodation and shelter to vessels drawing 17 feet of water. The imports are codfish, bricks, iron, coals, tobacco, colonial produce, hides, manufactured goods, linen, hardware, trinkets, Norway deals, and Dutch cheese. The exports are barilla, wine, raisins, almonds, lead, brandy, oranges, raw silk, saffron, oil, wool, mats and ropes, salt, liquorice, and aniseed. The vicinity of Valencia presents the appearance of a vast garden or orchard; and the inhabitants are chiefly devoted to agriculture, although many branches of trade flourish in the city. Velvets, taffetas, flowered damasks, and other silk stuffs are extensively manufactured. Woollens, camlets, hats, table linen, gauzes, artificial flowers, pottery and earthenware, tiles for flooring, glass, and paper, are also made, and a cigar manufactory employs over 3000 females. There is a railway to Madrid and another to Tarragona and Barcelona.

**VALENCIENNES**, a frontier military station of France, in the department of the Nord, situated on the railway from Paris to Brussels, 22 miles south-east from Donai, at the junction of the Rhonelle with the Scheldt. The town had 24,930 inhabitants in 1886; and is surrounded by fortifications and defended by a citadel constructed by Vauban. The streets are crooked, narrow, and irregular. The town-hall, the theatre, military hospitals, asylums, barracks, an arsenal, museum, the Church of St. Gery; the public library, which contains 25,000 volumes; and the academy of painting, sculpture, and architecture—are among the most remarkable buildings and establishments in the town. Valenciennes has civil and commercial tribunals; a chamber of commerce, council of prud'hommes, a college, custom house, &c. The celebrated Valenciennes lace is no longer made here, but in exchange the town possesses linen and cambric-muslin weaving mills, and very extensive iron-works, fed by the abundant coal in this neighbourhood. Valenciennes was the birthplace of Watteau the painter and of Froissart the historian.

**VALENS, FLAVIUS**, Emperor, was born about 328. He reigned from 361 to 378. He was a brother of VALENTIAN I., who, after being proclaimed emperor in 361, made him his colleague, and gave to him the government of the Eastern Empire, with Constantinople as his capital. He had almost at once to cope with and suppress a formidable insurrection under Prokopios, who at one time actually occupied Constantinople as emperor. Three years afterwards he was engaged in war with the Goths, who, in 370, sued him for peace, which he granted on condition they should not cross the Danube. In 375 his brother Valentinian died, and Valens was deprived of a wise adviser at a time when he was most in need of him. In the year following the Huns entered Europe from Asia, and after having subdued the Alani, pressed upon the Goths north of the Danube, some of whom were likewise subdued. About 200,000 West Goths or Visigoths fled to the Roman territory as suppliants, and after some natural hesitation on the part of Valens, they obtained permission to settle in it, with their women, children, and attendants, the whole amounting to nearly a million. The Goths being ill-treated soon grew dissatisfied with their new quarters, took up arms under Fritigern, and defeated the Romans, while Valens was residing at Antioch watching the movements of the Persians. As the Goths still resisted the Roman commanders, Valens marched against them from Syria with an army of veterans. A decisive battle was fought near Adrianople in 378, in which the Roman army was cut to pieces, and the emperor was burnt to death in a peasant's house, to which he had been carried wounded

from the battle. The reign of Valens is important from several causes. First, because in it the Goths were admitted south of the Danube, and the rapid disintegration of the Roman Empire thus formally began. Secondly, because in it the first division of the Roman Empire into East and West Empires was made. Thirdly, because in it the great Arian heresy flourished as a state religion for the last time. Instantly on the death of Valens the stout champion of orthodoxy, St. Gregory the Nazianzene, hurried to Constantinople and assumed the leadership of the orthodox Catholics, who for about forty years had been but a persecuted sect in the capital of the East; and on the accession of Theodosios, to whom Gratian gave the Empire of the East in 379, the Catholic form of faith rose to supremacy at Constantinople as at Rome and Alexandria. At the latter city Athanasius was pre-eminent during Valens' reign. Valens had even gone the length of bitterly persecuting the Catholics. On one occasion eighty Catholic priests were burnt together in a ship, and there seems good reason to suspect that the fire was not accidental. As soon as the death of the powerful Bishop Athanasius (the reputed, though not the real, author of the well-known denunciatory creed "Quicunque Vult") had put Egypt into his hands, in 373, Valens continued the persecution in that province which he had begun in the home regions. Fourthly, because of two distinguished men who ornament it—the magnificent figure of Athanasius bishop of Alexandria (died 373), and the saintly and learned Arian missionary-bishop of the West Goths, Ulfilas, the joy of philologists, and author of the oldest Teutonic book in the world, the *Muse-Gothic* translation of the Scriptures. Ulfilas saw the overthrow of Arianism, and died broken-hearted in 388.

**VALENTIA**, an island of Kerry in Ireland, 7 miles long by 2 broad, forms the safe harbour of Valentia, the most western in Ireland. It is separated from the mainland by a narrow strait. Roofing-slate is largely exported, as also agricultural produce. The eastern extremity of the Atlantic submarine telegraph cables are laid here. Area, 6371 acres; population, 2210. Its Munster name, Darryry, is derived from that of an ancient Druid prince.

**VALENTINE, ST.**, according to some ecclesiastical writers a bishop, according to others a priest, who assisted the Christians during the persecution under Claudius II., for which, in the year 270 A.D. he was put to death, being first beaten with clubs and afterwards beheaded. He was early canonized, and Pope Julian erected a church to his honour at Rome, in which city his relics are preserved. His day falls upon the 14th of February, and it is famous for a custom which formerly prevailed of choosing companions from the opposite sex by way of amusement. There is nothing in the recorded history of the saint to connect him with this practice, or to extend his patronage to it, and antiquarians have been divided in opinion as to the source of the custom. Wheatley, indeed, says that St. Valentine "was a man of most admirable parts, and so famous for his love and charity that the custom of choosing valentines upon his festival took its rise from thence;" but other writers derive the custom from the belief which formerly prevailed that birds mated upon that day, while a still more probable opinion connects it with the pagan festival of the Lupericalia. This was held in February, and among other ceremonies the names of young women were put into a box, from which they were drawn by the men as chance directed. The pastors of the early church, finding it impossible to extirpate the custom, changed its form, and appear to have chosen Valentine's Day for celebrating the new feast, because it occurred at nearly the same time. It is reasonable to suppose that the above practice of choosing mates would gradually become reciprocal in the sexes, and that all persons so chosen would be called *valentines*, from the day on which the ceremony took place.



In olden times Valentine's Day was a great popular festival. On the previous evening coteries of young unmarried folk would assemble, and inscribe upon little billets the names of an equal number of maids and bachelors. These would be mixed together in a common receptacle, and drawn lottery-wise; the person so chosen, due regard being had to sex, would be the drawer's valentine. It was customary to exchange presents between the parties thus connected by chance, but latterly the ladies were exempted from the obligation. In many of the English poets, Chaucer, Lydgate, Shakespeare, Drayton, Donne, and others, as well as in numerous popular ballads, we find allusions to the customs of the day; while a passage in "Pepys' Diary" shows that in the reign of Charles II. married as well as single people could be chosen. This passage, which throws a vivid light upon the old custom as it was then observed, runs as follows:—"This morning came up to my wife's bedside, I being up, dressing myself, little Will Mereer to be her valentine, and brought her name written upon blue paper, in gold letters, done by himself, very pretty; and we were both well pleased with it. But I am also this year my wife's valentine, and it will cost me £5. I find also that Mrs. Pierce's little girl is my valentine, she having drawn me, which I was not sorry for, it easing me of something more that I must have given to others. But here I do first observe the fashion of drawing of mottoes as well as names; so that Pierce, who drew my wife, did also draw a motto, and this girl drew another for me. What mine was I forget; but my wife's was 'Most courteous and most fair,' which, as it may be used as an anagram upon each name, might be very pretty." At a later period it became the custom for young unmarried persons to send anonymous poetical epistles to those whom they had chosen for their valentines; while for those who could not write poetry, sentimental or satirical verses, with appropriate illustrations, were prepared and sold. These are still issued in large numbers every February, and the 14th of that month is always a very heavy day for the post-office. The custom of sending presents has also been revived during late years, and gloves, scarfs, articles of jewelry, &c., are put up with ornamental missives as valentines.

**VALENTINIAN I.** (*Flavius Valentinianus*), Roman Emperor, reigned from 361 to 375. He was a native of Cibalus in Pannonia. He distinguished himself as a soldier in various campaigns under Constantine, Julian, and Jovian. His mind was uncorrupted by the sophistries of the age, and his body was strong and healthy. After the death of Jovian, in 361, Valentinian was proclaimed emperor by the army at Nikaia in Bithynia (Nice), but he divided the empire with his brother Valens, reserving for himself the western portion, and making Milan his capital. This was the first formal separation of the Roman world into two empires. The frontiers of the empire were exposed to great danger during his reign. Valentinian chose Paris as the centre of his operations against the barbarians, and through his general, Jovinus, he gained a victory over the *Alamanni* (*Allemands*, Germans) in 366. In 368 the *Alamanni* renewed their attacks upon Eastern Gaul, and plundered Mainz; but Valentinian drove them back, and took up his residence at Treviri (Trier or Trèves). He continued the war successfully against the Germans, and celebrated a splendid triumph. The Quadi and Sarmatæ invaded Pannonia in 374, and Valentinian, quitting his residence at Treviri, drove them back across the Danube. The barbarians sent to the emperor to ask for pardon, and in the audience which he granted them at Bregeti on the Danube (now Szony), he fell into such a passion that he broke a bloodvessel, and died in 375. His body was carried to Constantinople and interred there. The character of Valentinian is not easily drawn with impartiality. Unlike his brother Valens, who was an ardent persecuting

Arian, Valentinian patronized the orthodox Catholic faith, but he meddled little with religious disputes. Tolerant in some respects, he was cruel and intolerant in others. Though he did not persecute Arians or heathens, he was severe against Manicheans, Donatists, and others. His natural disposition does not seem to have been cruel, yet he committed many acts of undue severity. His character was pure and moral; he had good natural abilities, judgment, and discrimination, but no culture or learning. His reign was, on the whole, beneficial.

**VALENTINIAN II.** was a son of Valentinian I., and was only four years old when his father died. Gratian, who had been raised to the rank of Augustus or vice-emperor in 367, succeeded Valentinian I. in 375, and made his brother Valentinian nominally his colleague in the Western Empire, assigning to him the prefecture of Italy and the western part of Illyricum. The education of Valentinian was left to his mother, who brought him up as an Arian, which led to violent disputes between the imperial family and St. Ambrose, then Archbishop of Milan. The religious commotion in Italy induced Maximus, who, after the death of Gratian in 383, had become master of Gaul, Spain, and Britain, to aspire to the possession of the whole Western Empire. He invaded Italy, and Justina and her son fled for refuge to Theodosios, the emperor of the East. Valentinian was restored to his throne in 388 by Theodosios. After the death of his mother he abandoned the Arian doctrines, and put an end to the religious quarrels. In 392 Arbogastes, who was now aiming at the sovereignty of the West, induced the emperor to go to Vienne in Gaul. After a quarrel with Arbogastes, Valentinian was found strangled in his apartment, May, 392. He was not yet twenty-one years old.

**VALENTINIAN III.**, Roman Emperor, was a son of Constantius III. by Galla Placidia. After the Emperor Honorius. In 425, when he was only a boy of six years, his uncle, Theodosios II., raised him to the rank of Augustus or vice-emperor, and assigned to him the western portion of the empire, which his mother Placidia was to govern in his name as Augusta, though she was ill-fitted for such a task. Gaul was constantly invaded by fresh hosts of barbarians, but the great Roman general Aëtius compelled them to sue for peace. Africa was lost, and fell into the hands of Genseric, king of the Vandals. After the death of Theodosios II., in whose reign the Eastern Empire had been ravaged and ransacked by the Huns, Attila, their king, invaded Gaul. But in 451 the Huns were defeated in the plains of Châlons by Aëtius, with the assistance of the now friendly Goths of Gaul, and were driven across the Rhine. In the year following they invaded Italy, and as Aëtius had not sufficient troops to meet them, their forbearance was purchased by great sacrifices. The greatness of Aëtius had long nourished the jealousy of Valentinian, who, in 454, slew him with his own hand. The worthless tyrant was himself assassinated in the following year by an officer whose wife he had violated. He was as contemptibly feeble as he was viciously depraved.

**VALENTINIAN'S.** See GNOSTICISM.

**VALERAL or VALERIAN ALDEHYDE** is obtained from the dry distillation of the valerates, and also by the oxidation of gluten, castor-oil, and some other substances. It is a colourless liquid of great refracting power, having a fruity odour. The formula is  $C_5H_{10}O$ , and the specific gravity 0.8057. It boils at  $96^\circ C.$  ( $205^\circ Fahr.$ ), and is very inflammable, burning with a bright blue flame. It is insoluble in water, but soluble in alcohol, ether, and oils. When exposed to the air it is gradually converted into valeric acid. It combines with ammonia, forming valeral-ammonia, a crystalline substance having the formula  $C_5H_{10}ONH_3$ .

**VALERAMIDE** is the amide of valeric acid. It is a crystalline substance, insoluble in water, and having the

formula  $C_{12}H_{19}OH_2N$ . It melts at  $100^{\circ}$  C. ( $212^{\circ}$  Fahr.), and sublimes unchanged. When ignited with potassium it gives off hydrogen and carburetted hydrogen, and forms potassium cyanide.

**VALERIAN** (*Publius Licinius Valerianus*), Roman Emperor, reigned from 253 till 260. He was a Roman by birth, and descended of a noble family. In 253, when the Emperor Gallus was murdered by the insurgent Æmilianus, Valerian, who had the command of the legions in Gaul and Germany, hastened to Italy; but Æmilianus was put to death by his own soldiers before the arrival of Valerian, who was then himself immediately proclaimed emperor by them. Valerian, who was now at least sixty years of age, appointed his son Gallienus his colleague in the empire; but it was an unfortunate choice. Though Valerian was a man of good character, wise, and experienced, his reign was a series of calamities. While the empire was invaded by the Goths on the side of the Danube, Sapor I., king of Persia, disturbed the eastern provinces. Valerian marched against the Persians, regained possession of Antioch, which had been taken by the enemy, and drove them across the Euphrates. But the Romans were afterwards defeated near Edessa, and the emperor was treacherously seized by Sapor in 260 while holding a conference with him. He died in captivity, after suffering the greatest indignities. In the early part of his reign Valerian was tolerant to the Christians, but in the latter part he persecuted them. The empire, left to the weak rule of the Nero-like Gallienus, a cruel, indolent voluptuary, fell into disorder, and so many pretenders to the throne arose that the period is called that of the *Thirty Tyrants*.

**VALERIAN** (*Valeriana*) is a genus of plants, the type of the natural order VALERIANACEÆ. The species are numerous, natives of Central Europe, the mountainous parts of India, and South and North America. The species are herbs with a perennial root-stock, and an erect flowering stem, rising from the midst of a tuft of leaves, the lower of which are generally entire, and the upper pinnately divided. The flowers are generally numerous, arranged in terminal clusters or heads. The corolla is five-lobed and spurless; the stamens are three. The fruit is one-celled, indehiscent, crowned by a bell-shaped feathery pappus, formed by the expanded limb of the calyx.

The Wild or Official Valerian (*Valeriana officinalis*) is a native of Europe, and by the sides of rivers and in ditches and moist woods is abundant in Great Britain. It grows to a height of from 2 to 4 feet, and has small flesh-coloured flowers. The root-stock has a warm, aromatic, slightly bitter taste and a very foetid odour. It is very attractive to cats, on whom it exercises an intoxicating influence; it is employed by rat-catchers to decoy rats. It is used also in medicine at the present day as a stimulant in nervous affections. The peculiar odour seems due to VALERIC ACID. The Red Valerian (*Valeriana rubra*) is indigenous to the south of Europe, the Levant, the north of Africa, and Mount Vesuvius. It is found occasionally wild in England, but as it is a very commonly cultivated plant there is no reason to suppose that it is anything more than an escape from gardens. The Small Marsh Valerian (*Valeriana dioica*) is abundant in some parts of Great Britain. Its roots are often substituted for those of the official valerian, but they possess little medical value. It is a creeping plant, found in boggy and marshy places, growing to a height of from 6 to 12 inches, with generally unisexual flowers. The Pyrenean Valerian (*Valeriana pyrenaica*) is a native of the Pyrenees, but has been largely cultivated in British gardens, and is found occasionally apparently wild; it is distinguished by its large, heart-shaped, toothed leaves. The Garden Valerian (*Valeriana Phu*) is a native of Europe, in Belgium, Alsatia, Switzerland, Silesia, &c. It has a thick, knotted, pale-green root. The flowers are white, and give out a pleasant smell. *Valeriana Sitchensis*,

a native of North-western America, is considered to possess the properties of the genus in greatest strength. The roots of *Valeriana celtica* and of several other Alpine species are sweet-scented, and are exported for perfuming baths, as a substitute for SPICE-NARD.

**VALERIANACEÆ** is an order of plants belonging to the group Gamopetalæ, cohort Asterales. [See BOTANY.] About 300 species are known, natives of temperate climates or elevated positions in both the Old and New World. They are more abundant in the north of Asia, Europe, and South America, than in Africa or North America. They are herbs with opposite, simple, or compound exstipulate leaves and small flowers in terminal cymes or panicles. The tube of the calyx is adherent to the ovary, and the limb is obsolete or forms a feathery pappus on the top of the ovary. The corolla is epigynous, tubular, three to six-lobed, sometimes spurred at the base; the stamens are one to five, distinct, inserted into the tube of the corolla, and alternate with its lobes. The ovary is one-celled, with two abortive cells, and a single pendulous ovule in the fertile cell. The fruit is dry and indehiscent.

Many of the species of this order have strong aromatic properties, especially in their roots. Several of the species of *Valeriana* (VALERIAN) are used in medicine. The SPICE-NARD of the ancients is *Nardostachys Jatamansi*, a native of Northern India; *Valerianella olitoria* (the lamb's lettuce) is cultivated as a salad.

**VALERIANELLA** is a genus of plants belonging to the order VALERIANACEÆ. *Valerianella olitoria* (common corn-salad or lamb's lettuce) is a weak succulent herb, from 1 inches to a foot high. It is a native of Europe, in corn-fields and cultivated ground, and is found abundantly in such situations, especially in a light soil, in Great Britain. In France and Germany it is much eaten as a salad, and is frequently cultivated for that purpose in this country. It is chiefly valued because it is easily cultivated, and can be used in early spring; the flavour is insipid. It is an annual with repeatedly forked stems, the lower leaves somewhat spoon-shaped and the upper oblong, and small bluish-white flowers in dense terminal clusters. Several other very similar species are found in Britain, and also on the continent of Europe, all of which may be eaten as salads.

**VALERIC ACID, or VALERIANIC ACID**, an acid first obtained by Chevreul from the fat of *Delphinium phocæna*, and thus called sometimes Phœnicic or Delphinic Acid. It is found largely distributed in the animal and vegetable kingdoms. Many animal oils contain it, and it is found in the root of the valerian (*Valeriana officinalis*, natural order Valerianaceæ), in the root of angelica (*Archangelica officinalis*, natural order Umbelliferae), in the bark of the elder tree (*Sambucus nigra*), and in that of the guelder rose (*Viburnum opulus*), both plants of the natural order Caprifoliaceæ. It is a frequent product of the oxidation of fats, and of putrefaction of nitrogenous substances. It may be prepared from anilic alcohol or fusel oil by oxidation with sulphuric acid and potassium bichromate. It is a colourless oil, having a strong and persistent odour of valerian. The formula is  $C_{10}H_{16}O_2$ . The specific gravity is 0.937; the boiling point is  $175^{\circ}$  C. ( $347^{\circ}$  Fahr.) It is soluble in water, alcohol, and ether. It forms with bases a number of neutral salts called valerates or valerianates, and having the general formula  $C_{10}H_{15}MO_2$ ; these are mostly crystalline, and soluble in water.

The valerianate of zinc ( $C_{10}H_{15}ZnO_2$ ) is used in medicine. Valeric anhydride or valeric oxide ( $C_{10}H_{14}O_2$ ) is a colourless oil having an odour of apples. It is insoluble in water, has a specific gravity of 0.934, and boils at  $215^{\circ}$  C. ( $419^{\circ}$  Fahr.) Valeric ether,  $C_{10}H_{16}(C_2H_5)_2O$ , is a colourless liquid, boiling at  $133^{\circ}$  C. ( $271^{\circ}$  Fahr.), and having a specific gravity of 0.866. It is insoluble in water.

Valerol ( $C_{10}H_{18}O$ ) is the ketone of valeric acid. It is

a light colourless liquid of pleasant odour, boiling at 165° C. (329° Fahr.) Valerylene ( $C_6H_8$ ) is a colourless hydrocarbon of strong garlic odour, which boils at 46° C. (113° Fahr.)

**VALE'RIUS, CAIUS**, surnamed *F'laccus*, a Roman poet who flourished under Vespasian, was a native of Padua. His only extant poem is the "Argonautica," an imitation of the Greek poem of Apollonios Rhodios, which bore the same name. It was edited by Wagner (Göttingen, 1805).

**VALE'RIUS MAXIMUS**, a Roman historian of uncertain prænomen, lived under the Emperor Tiberius, whom he addresses with a servile adulation on several occasions in the course of his work. This bears the title "De Factis Dictisque Memorabilibus," libri ix., and is commonly known as the *Memorabilia* of Valerius Maximus. It consists of historical and biographical anecdotes, taken partly from Roman, partly from foreign history, but always so arranged as to inculcate some moral lesson. The book is of some value as throwing light on the legal and social institutions of the Romans; but the historical statements are loose and inaccurate, and it is evident the author was more anxious to point a moral or adorn a tale, than to narrate events as they really happened. The style is very bad—clumsy, verbose, and inelegant—whence many eminent critics have concluded that the work is not a genuine relic of the Augustan age. The general opinion of modern authorities seems, however, to be in favour of its authenticity. With Cato and Seneca, Valerius Maximus was a favourite writer at the time of the revival of learning. Among the best of the old editions are the Variorum (1670) and the Delphin (1679); that of Torrenius (Leyden, 1726); and that of Kappius, (Leipzig 1782). There is no good modern edition.

**VALE'RIUS, PUBLIUS**, surnamed *Poplicola*, one of the most active popular leaders in Rome at the time of the expulsion of the Tarquins. He held the consulship four times; and during his first consulship, along with Horatius, he carried the celebrated *Lex Valeria Horatia*, which conferred legal power on the assemblies of the people.

**VALET'TA**, the capital of Malta, on the north-east coast, derives its name from the founder, La Valette, one of the grand-masters of the Knights of St. John, by whom it was begun and completed (1566–71), with the aid of the principal powers of Europe, as it was designed to be the bulwark of Christendom against the Turks. The town occupies a neck of land running out into a bay, and dividing it into two harbours, one of which is used for quarantine purposes, while the other, and the larger, is the great port. The Citadel of St. Elmo, with a lighthouse, stands at the extremity of the projection. Fortifications crown the adjoining slopes, and are supposed to render the place impregnable. It serves as the headquarters of the Mediterranean fleet, a calling station for steamers on the route to India, and a depot for articles of British commerce intended for the countries of Eastern Europe and the Levant. The houses are of stone, and flat-roofed, the terraces of which are used to enjoy the cool air of morning and eventide; and the streets are well paved and lighted. Most of the public buildings date from the time of the knights, but those devoted to government purposes have undergone great alterations. The residence of the governor was the palace of the grand-masters. The Royal Naval Hospital was originally a house built for a private member of the Order, but has been re-modelled and enlarged for its present object. It has an imposing appearance, seated on high ground on the left of the great harbour, on entering. A few miles to the westward of Valetta, a small inlet on the coast has the name of Porto de San Paolo, or the Port of St. Paul, as the supposed point where the vessel which carried him was driven ashore. The population is about 60,000.

**VALHAL'LA**. See WALKYLLA.

**VAL'KYRES**. See WALKYRES.

**VALLADOLID'**, ancient *Pintia*, the capital of the Spanish province of Valladolid, 100 miles north-west of Madrid, on the railway to Burgos, stands on a plain bordered by limestone hills, at the confluence of the Pisuerga and the Esgueva, and has 52,206 inhabitants. It is more than 2000 feet above the sea, and although occasionally subject to high winds, the air is generally pure and genial, and the climate healthy. The city, which was for a long time the capital of the whole country, and the residence of several Spanish kings, is full of sumptuous edifices and palaces, which, though now untenanted and some of them falling to ruin, give it a very imposing aspect. The cathedral, a splendid but unfinished edifice, was built by Juan de Herrera. The church and convent of the Benedictines, that of San Gregorio and Las Huelgas, are very handsome; but the College of San Pablo is the most remarkable edifice in the town, from its general elegance and the exquisite finish of the bas-reliefs on its façade. This college, and the Convent of San Gregorio, are among the finest Gothic religious edifices in the world. The royal palace is also a very fine building of mixed architecture, but, like the two preceding, it suffered much during the Peninsular War. The *cancillería real*, in which the High Court of Appeal for the two Castiles and the Basque Provinces sits, is a fine structure in the Tuscan order. There are also a well-frequented university, founded in 1346, which was at one time celebrated for its school of jurisprudence; several colleges; an academy of the fine arts, which possesses a fine collection of models in sculpture, architecture, and painting; and a museum of painting and sculpture, formed of the works found in suppressed religious houses.

Valladolid was formerly an opulent commercial city; and its manufactures of woollen stuffs, silk, cotton, jewelry, hats, paper, and perfumery, are still of importance. Trade has considerably increased since the opening of the canal between the Pisuerga and the Duero, and the railway from Burgos to Madrid. The neighbourhood is exceedingly fertile, and produces good white wine, madder, silk, olives, and corn. The town gives title to a bishop, and is the residence of a captain-general and other public functionaries of the province. It is inclosed by old walls, with six gates. Columbus died in this city, 20th May, 1506.

**VALLEYS**. This term may be applied in its most comprehensive meaning to depressions on the surface of the globe. The largest valleys form the beds of the great oceans. But in the common acceptance of the term, it refers to those depressions which are observable above the sea-level, separating or intersecting mountain ridges, and, in fact, breaking them up into separate mountain masses; and in which the basins of inland seas and lakes, and the beds of rivers, occur. Mountains and hills, therefore, are their boundaries. Valleys parallel to the mountain ridges or chains which they separate, or which inclose them, are said to be longitudinal; while those the direction of which is across the heights, are called transverse. Both may be principal or lateral, the latter designation being usually applied to the smaller transverse valleys uniting with the principal. In all hilly and mountainous districts, valleys of every possible variety of form and magnitude occur. No doubt the great valleys of mountain chains, and those enormous depressions which hold our seas and lakes (except such lakes as are due to volcanic action, and are in fact craters of extinct volcanoes) are produced chiefly by the crumpling of the earth's surface as it cools—a crumpling of stupendous force and magnitude, but after all of the same kind as the wrinkling of an apple's skin. But there is a very large class of valleys, the river-valleys, which in most instances are not at all due to such a cause, and if partly due to that, as is the case sometimes, have

used it only as a starting-point whence to attain their present dimensions. The denuding power of rain is enormous, and the materials it washes off the land are carried away to the river, which scours and ever deepens its bed, the rain washing down the banks at the same time, until a great valley is formed, continually widening and deepening by the same actions as at first produced it. Calculations have been made as to the Thames valley, of great minuteness and accuracy; and they have shown that apart from the more rapid deepening of the narrow river bed itself, the whole valley has been reduced by one inch since the Norman Conquest, and in a million years would be brought down by rain and river to the sea-level. A million years is no impossible era for the geologist to contemplate. Perhaps an illustration used by Professor Huxley in his "Physiography" may put this clearer. Imagine a mass of stone 100 feet square and 100 feet high; the Thames carries down to the sea no less than fourteen such enormous cubes (14,000,000 cubic feet) of solid matter every year. Yet the Thames is quite a small river; and this action, so great already in this minor example, becomes stupendous when we take one of the large rivers of the world. The Mississippi, for instance, carries to the sea annually, as the wearing down of its valley, 812,500,000,000 lbs. in weight, say 370,000,000 cubic feet. Thus it is that the rivers, as a rule, plough out their own valleys. Another source of what might fairly still be called river-valleys lies in the action of ice-rivers or glaciers, and the friction of ice being greater than that of water the denudation is proportionately swifter.

**VALLIÈRE, DUCHESSE DE LA** (*Louise Françoise de la Banne le Blanc*), was born in Touraine in 1644. She was brought up at the court of Gaston, duke of Orleans; and on the marriage of that prince to Henrietta of England, was appointed lady of honour to the duchess. In 1661 Fouqué, the well-known minister of finance, paid his addresses to her; but they were indignantly rejected, as her beauty and fascinating manners had already attracted the attention of the king, for in spite of a slight lameness from which she suffered, she was one of the most graceful ladies of the court. Their intimacy, which commenced about this time, was at first carried on in secret. She bore four children to Louis, of whom two survived—Mademoiselle de Blois and the Count of Vermandois; the latter of whom was legitimated in 1667, and a duchy was at the same time conferred upon his mother. It is admitted that the duchess did not abuse her influence with the king for bad or selfish ends, and that she was devotedly and sincerely attached to him; but it was not to be expected that she could permanently retain the affliction of the fickle and profligate prince. His regard for her having gradually withdrawn through the intrigues of Madame de Montespan, the duchess in 1674 entered the convent of the Carmelites at Chaillot, and took the veil in the following year as Sœur Louise de la Miséricorde. She seems to have enjoyed amid the austeries of this retreat a degree of contentment, if not of happiness, to which she had previously been a stranger. In the lapse of years, when Madame de Montespan had been set aside in her turn, she might be seen at the Carmelites seeking religious counsel of the poor penitent whom she had tormented and displaced. The duchess died in 1710.

**VALLISNERIA** is a genus of plants belonging to the order HYDROCHARIDACEÆ. The species are small aquatic plants. Only two are known, one of which is confined to Australia, while the other is widely spread over the fresh-waters of the warm parts of both hemispheres. The latter, *Vallisneria spiralis*, has been introduced into this country from Southern Europe, and is common in the fresh-water aquaria. It is very interesting from the remarkable way in which fertilization is effected.

It is a perennial herb, with a very short stem, from the sides of which suckers are produced and give rise to new plants. From the stem rises a tuft of thin, narrow, grass-like leaves, a yard or more in length. The plants are dioecious, but those bearing male flowers usually grow in close proximity to those bearing female flowers. The male flowers are very minute, white, and globular, seated many together on a short stalk, the whole being inclosed by a spathe, which divides at maturity. The male flowers then separate from the common stalk, and rise to the surface of the water and expand; they have a three-parted calyx, and from one to three fertile and several barren stamens. The female flowers have a three-lobed calyx, three barren stamens, and a cylindrical inferior ovary with three large stigmas. Each female flower is inclosed in a tubular spathe, borne at the end of a long spirally-twisted stalk, which uncoils to allow the flower at maturity to come to the surface of the water, where it expands. The anthers of the male flowers, floating on the surface, then burst and eject the pollen so as to come into contact with the stigmas of the female flowers. After fertilization has taken place the female flower returns to the bottom of the water by the spiral contraction of its stalk, and the fruit is there ripened. The fruit is a cylindrical berry containing numerous seeds.

The leaves of this plant are good objects for the microscope, affording admirable illustrations of the structure of the vegetable cell and of the rotation of its protoplasmic contents (*cyclosis*).

**VALLOMBROSA**, a celebrated abbey in Tuscany, which derives its name—the "unbragous valley"—from its position in a richly wooded hollow, where pine and beech and fir cast a pleasant shade. The reader will remember Milton's allusion to this characteristic:—

"Thick as the leaves in Vallambrosa."

Its scenery is assuredly adapted to stimulate the fancy both of poet and artist. The abbey was founded about 1080 by a Benedictine order of Grey Monks, and receiving costly endowments grew very prosperous and influential. During the French rule in Italy it was an asylum for dispossessed priests. The monks returned to it after 1815, but they are now very few in number, and their chief occupation is to act as cicerones to visitors attracted by the picturesque beauty of the site. The buildings are remarkable for splendour, rather than architectural excellence. They were erected about 1636-40.

**VALOIS, LE**, a district in France, comprised in the former province of the Ile-de-France, and now forming portions of the departments of OISE and AISNE. Compiègne, Senlis, Crespy, Villers-Cotterets, and La Ferté-Milon, were its chief towns. Philip III., king of France, gave the county of Valois (1285) to his second son Charles, whose son Philip became king of France. The kings of France, from Philip VI. to Henry III. inclusive, belonged to the house of Valois.

**VALPARAISO**, a large town and important seaport of Chili, South America, situated 55 miles W.N.W. from Santiago, and 225 north from Concepcion, consists chiefly of long streets, built under a high cliff, and along the windings of the shore of the Pacific. It stands on a flat terrace of varying breadth, and on heights extending inland; it is well built, in the style rather of an English colonial than of a Spanish town. It is almost entirely new, the former town having been destroyed by earthquake in 1822, and it has since frequently suffered severely from the same cause. The streets are traversed by a street railway. There are several churches, a theatre, colleges, hospitals, and literary and scientific institutions. The city, indeed, offers most of the advantages possessed by places of larger extent and importance in other parts of the world; and has its places of public amusement, besides

the charms of private society, on a considerable scale. Large mail steamers ply continually between the port and Europe both by the northern route *via* Panama, and the southern by the Strait of Magellan, thus keeping up quick and frequent intercourse with the great centres of civilization. English is generally taught in the schools, being considered an essential branch of education. The streets are well paved. The Protestants have a cemetery and two places of worship. A handsome suburb on the cliff is chiefly inhabited by the foreign merchants, who are mostly British, American, and French. The harbour is good, with 9 fathoms water close in shore, of easy entrance and sheltered from all winds except the north; it is defended by three forts and a battery on a level with the water. There are large shipbuilding yards and extensive bonding warehouses. Many vessels engaged in the Pacific trade visit Valparaiso for provisions, which can be put on board without their dropping anchor. The town is the central depot for the produce of Chili, and has a larger trade than any other place in the country. It is connected with Santiago by railway. The inhabitants have increased very rapidly, the population having been only 10,000 in 1825, and 100,000 in 1888. Large quantities of corn and other articles of provisions are shipped here for Callao and Panama. Besides wheat, the chief exports are—copper and copper ore, gold and silver, tallow and hides, timber, indigo, wool, sarsaparilla, fruits, &c. The imports are—foreign manufactured goods, chocolate, tea, coffee, sugar, tobacco, hardware, &c. The French and American commerce is also very important. Steamers ply regularly to Callao and other Pacific ports. The town was bombarded by a Spanish fleet in 1866, and an immense amount of property destroyed. The name means "Vale of Paradise," and was given to it in consequence of its delightful situation.

**VALSE.** See WALTZ.

**VALUE**, in political economy or economics (to use the newer term), means purchasing power, or power in exchange, or as Professor Walker puts it more fully ("Political Economy," Part I., Chapter i.), "Value is the power which an article confers upon its possessor, irrespective of legal authority or personal sentiments, of commanding, in exchange for itself, the labour, or the products of the labour, of others." The importance of the exceptions made is obvious. Legal authority can command services, as for instance those of an army levied by conscription, without an equivalent consideration, but these services are not economic, because they are not voluntary. Yet even voluntary services are not necessarily economic. "The mother hangs over the sickbed day and night, draining her very life-blood to save her child. Her services are not economic, because they are dictated by a purely personal sentiment."

The distinction between price and value has already been indicated in the article PRICE. While value is general purchasing power, price is purchasing power expressed in terms of some one article, usually money.

Before considering whence an article derives this power-in-exchange or value, it is necessary to clearly distinguish between value and utility. An article may be of the highest utility—value-in-use, usefulness—without possessing any economic value or power-in-exchange. Air and water, for instance, are clearly of the greatest possible utility, yet, in ordinary circumstances, neither has any value. Utility and value, then, must not, in economic reasoning, be used interchangeably, as they so often are in ordinary speech. Utility is, however, always and everywhere the main element of value. It cannot be assumed that a man will give his labour or the products of his labour for that for which he has no use. At the same time the broadest interpretation must be given to the word useful. "By that term," as Professor Walker states,

"the economist signifies only that an article answers a felt human want—that men have a use for it. The appetite from which that sense of want arises may be vicious, the object itself may be prejudicial, even pernicious," but so long as the desire for possession exists, arise how it may, its object is, in the economic sense, useful; that is, answers a human use.

The vital importance of the distinction between value-in-use and value-in-exchange, in forming a sound theory of value, was insisted upon both by Adam Smith and his great French contemporary, Turgot.

Adam Smith, however, committed himself to the untenable proposition that "labour, *never varying in its own value*, is alone the ultimate and just standard by which the value of all commodities can at all times and places be estimated and compared." He also fell into the error, refuted by Ricardo, of supposing that rent ordinarily forms part of the price of agricultural produce.

John Stuart Mill, one of the greatest of Adam Smith's disciples, devoted much attention to the problem of value, and went so far as to assert in his "Principles of Political Economy," that "there is nothing in the laws of value which remains for the present or any future writer to clear up; the theory of the subject is complete." As this opinion is still held by many economists of the old school, the following propositions from Book III., Chapter iv., of the work in question, are quoted as clearly setting forth the main points of his theory of value:—

1. Value is a relative term. The value of a thing means the quantity of some other thing, or of things in general, which it exchanges for. The values of all things can never, therefore, rise or fall simultaneously. There is no such thing as a general rise or a general fall of values. Every rise of value supposes a fall, and every fall a rise.

2. The temporary or market value of a thing depends on the demand and supply—rising as the demand rises, and falling as the supply rises. The demand, however, varies with the value, being generally greater when the thing is cheap than when it is dear; and the value always adjusts itself in such a manner that the demand is equal to the supply.

3. Besides their temporary value, things have also a permanent, or as it may be called, a natural value, to which the market value, after every variation, always tends to return; and the oscillations compensate for one another, so that, on the average, commodities exchange at about their natural value.

4. The natural value of some things is a scarcity value; but most things naturally exchange for one another in the ratio of their cost of production, or at what may be termed their cost value.

5. The things which are naturally and permanently at a scarcity value, are those of which the supply cannot be increased at all, or not sufficiently to satisfy the whole of the demand which would exist for them at their cost value.

6. A monopoly value means a scarcity value. Monopoly cannot give a value to anything, except through a limitation of the supply.

7. Every commodity of which the supply can be indefinitely increased by labour and capital, exchanges for other things proportionally to the cost necessary for producing and bringing to market the most costly portion of the supply required. The natural value is synonymous with the cost value, and the cost value of a thing means the cost value of the most costly portion of it.

8. Cost of production consists of several elements, some of which are constant and universal, others occasional. The universal elements of cost of production are, the wages of the labour and the profits of the capital. The occasional elements are, taxes, and any extra cost occasioned by a scarcity value of some of the requisites.

The market value spoken of above is always supposed

to be determined by competition among the buyers and sellers. Competition signifies the unrestrained operation of individual self-interest, and implies that each man in exchange tries solely to get the most he can from others, and to give the least he must himself. The idea of competition is opposed to combination of any sort, either to fix a price or regulate the amount to be bought or sold. It is equally opposed to custom. Whenever buyers or sellers do anything because they have been used to do it, they depart from the rule of competition, which makes the self-interest of the moment predominant over every other consideration whatever.

In the above extracts, while the fluctuations in the market value of an article are briefly dismissed with a somewhat vague reference to the law of supply and demand, the "natural value" is often referred to, and described as practically the same as the cost of production. The idea underlying the whole is apparently that cost of production is, speaking generally, the ultimate source of value.

"But," as Professor Walker says, "it is not because an article has cost labour that it possesses value. It is only because it cannot now be obtained without labour. In any given instance it is not necessary that a thing, to have value, should itself have cost labour in any degree; while it is not at all uncommon to find an article having a value equal to that of another article which cost twice as much labour as itself."

It remained for Professor Jevons, turning from the somewhat narrow and empirical treatment of value-in-exchange by Mill and his predecessors, to discover the true theory of exchange-value, which was almost at the same time independently discovered by Gossen in Germany, and M. Léon Walras in France.

This theory of value rests entirely on the consideration of quantities of utility without reference to labour or cost of production. Before attempting to explain it we must, to use Jevons' own words, "carefully discriminate between the *total utility* arising from any commodity, and the utility attaching to any particular portion of it. Thus the total utility of the food we eat consists in maintaining life, and may be considered as infinitely great; but if we were to subtract a tenth part from what we eat daily our loss would be but slight. We should certainly not lose a tenth part of the whole utility of food to us." "Let us imagine the whole quantity of food which a person consumes on an average during twenty-four hours to be divided into ten equal parts. If his food be reduced by the last part, he will suffer but little; if a second tenth part be deficient, he will feel the want distinctly; the subtraction of the third tenth part will be decidedly injurious; with every subsequent subtraction of a tenth part his sufferings will be more and more serious, until at length he will be upon the verge of starvation." Reversing the process we see that each successive tenth part is less necessary or possesses less utility than the previous one. The term "final utility" is applied by Jevons to the last appreciable quantity which the purchaser is ready to take, and which a producer is ready to supply. It may be expressed either in terms of money or in any given article of exchange. It is a well-established economic doctrine that in the same open market, at any moment, there cannot be two prices for the same kind of article. Therefore the purchaser, instead of giving the extreme price he might be prepared to pay for the first medium of any given article, say food, rather than go without it, pays "one price for the whole, the same for every equal part;" that price measures the final utility of the food to him (that is, the utility of the portion at which he ceases to buy, preferring to keep the money in his pocket rather than obtain more of the food at the price), and is at the same time the sum at which the seller prefers to keep his goods rather than take less.

It is impossible to deal adequately with Jevons' great theory in a brief article such as this, and we can only refer the reader to his "Theory of Political Economy" (second edition, London, 1879). Enough has, however, been said, it is hoped, to show how in its light the vagueness and confusion found in many earlier writers with regard to the great principles of supply and demand clear away, and most of the phenomena of exchange which formerly had to be dealt with as exceptional are seen to come under the general law of diminishing utilities.

The old theory, especially as given in the quotation from Adam Smith at the beginning of this article, which makes labour the only standard of value, has been eagerly seized by Socialist writers (notably Karl Marx, see SOCIALISM) and made the foundation of a serious indictment against the existing capitalist form of industrial organization, which loses much of its force when confronted with the new theory of value sketched above, and virtually accepted by Professors Walker, Sidgwick, and other leading economists of the present day, though divested of the mathematical form which Jevons, Walras, and others have insisted upon giving to it.

**VALVE.** The ordinary pump-valve, frequently called a clack, consists of a piece of leather rather greater than the bore or orifice. Circular plates of lead or brass are fastened to the upper and lower surfaces of the leather; and the valve thus formed is capable, from the flexibility of the leather, of turning, as on a hinge, at the place of its connection with the rim. After a certain quantity of water has forced its way through the orifice, the valve, by its weight, falls, and closely covers the opening, so that the water above is in great part prevented from returning.

Frequently a narrow bar of metal is made fast across a circular orifice in the direction of a diameter, and two semi-circular valves of leather, each of which is covered above and below with a brass plate of the same form, turn upon the sides of the bar as upon hinges. This is called the Double-clack or the Butterfly-valve.

The conical or spindle valve is a metal body in the form of a frustum of a cone, the side of which makes an angle of 45 degrees with a diameter of the base, and its convex surface is ground so as to fit exactly the corresponding side of the orifice. The frustum is lifted up vertically by the pressure of the steam, and when that has passed, it falls back by its weight.

The valve employed for the usual air-pumps consists merely of a slip of thin bladder thoroughly soaked in oil, its breadth being little more than is necessary to cover the orifice. When the pressure of the atmosphere is in part removed from the barrel, some of the air which is in the receiver forces its way, by its elasticity, through the orifice, and escapes at the sides of the valve. The valves of machines for condensing air are like those of a racying pump, but are placed in contrary positions.

**VALVE, SAFETY.** (Lat. *valva*), in mechanics, a contrivance by means of which a boiler is preserved from bursting by the force of steam. The valve is placed on an aperture in the top of a steam boiler, and retained in position by the aid of weights heaped upon it by the pressure of a lever of the second kind, or by means of a lever and spring. Locomotives require two loaded valves, of which one is kept down by a pile of weights, the other by a lever and spring. Stationary engines, on the contrary, are generally fitted with one valve, which is retained in position either by weights or by lever. The valve is of peculiar value, and without it, we may say, the steam-engine could not exist. Thus, whenever the steam in the boiler rises above a certain tension, the valve gives way under the superior pressure, permits the superfluous vapour to escape, and then returns to its original position. The invention, originally due to Denis Papin [see PAPIN, DENIS], is theoretically one of perfect "safety." It is



necessary, however, to be assured that the valves are not subjected to too great a weight, or serious accidents will inevitably ensue.

An improved safety-valve balance, the invention of Mr. William Cameron, of Reading, U.S., which has been for some time in use on the American railways, deserves to be generally adopted in the United Kingdom. It was intended at the outset for locomotive engines, in which a dead weight cannot be used with boilers that rest on springs, as its action on the valve would be influenced by the vibrations continually occurring. It can be used, however, on marine engines, or wherever a dead weight is considered objectionable. Its chief recommendation is, that it requires no attention when in use, as it forbids an increase over the allotted pressure. The arms A A, can rise as much as the safety-valve requires without additional pressure, which renders the balance equal in efficiency to a dead weight. Another great advantage is in the lever arrangement, by which means existing defects are remedied. The arms of the lever, A, inside the casting, B (fig. 2),

Fig. 1.

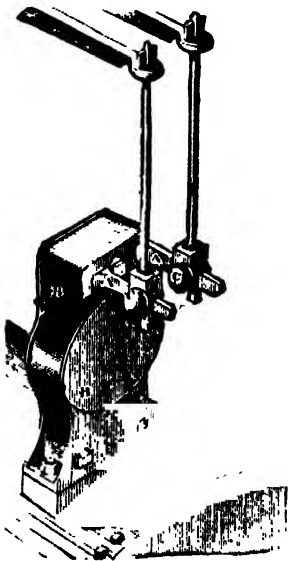
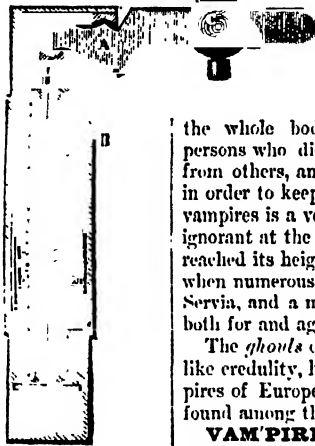


Fig. 2.



from the fulcrum to the springs, are at an angle with the outside arms; and an upward movement of these outside is accompanied by a corresponding downward and also inward movement of the inside arms resting on the springs; therefore the more the springs are compressed the shorter the effective length of the inside will be, thereby increasing the power of the outside arms in the same proportion as the springs get stiffer from compression, thus enabling them to rise the required distance without increase of power. The rod, C, is fastened by a set screw to any distance from the fulcrum, according to the pressure required. Close behind this rod a small pin can be inserted through the arm to prevent the engine from increasing the pressure beyond what the boiler was intended to carry; but as much of the arms as are not in the way of anything may be allowed to protrude for the purpose of decreasing the pressure, should any accident to the boiler make such a course desirable.

**VAMPIRE** (Russ. *vampir*; Ger. *vampyr*), a horrible creation of popular superstition, the dread of which is common among the ignorant masses of Russia, Hungary, Poland, and of the Slavonic, Romanic, and Greek population of the Lower Danube and the Thessalian peninsula.

The details concerning the origin and nature of the vampires, called also by the Servians *rukodlaks*, and by the Wallachians *murony*, differ considerably among the different peoples; but in every case they are described as persons who, for an indefinite time after death, leave their tombs at night in order to suck the blood of the living during sleep, or even to devour their hearts and destroy them. In White Russia and the Ukraine such creatures are supposed to be dead wizards, heretics, or were-wolves, and the Greeks consider them to be such as have died under the sentence of excommunication; but the Bulgarians, Servians, and Wallachians believe that any one, whatever his former life may have been, who has been bitten by a vampire, or over whose corpse a cat or boy jumps, may become a vampire. Such persons are supposed to know no decay, but to lie during the day time in their graves, having a fresh red colour on their faces, warm blood, and growing hair and nails, and at night, especially during the time of full moon, they are able to come out to seek sustenance from the bodies of the living. Where persons have supposed themselves to be in danger of

vampires, it has been usual to open the grave of the suspected vampire and to examine the corpse. If the latter was found to be in a state of decay all fear was removed, but if it appeared fresh then drastic measures were resorted to in order to prevent it disturbing the living. In some cases a nail was driven in the forehead, in others a fresh green stake was thrust through the body at a single blow, or the heart, or even

the whole body was burned. Formerly in England persons who died by their own hands were buried apart from others, and a stake was driven through their bodies in order to keep them quiet in their graves. The belief in vampires is a very old one, and it still prevails among the ignorant at the present day; but the period during which it reached its height was during the five years from 1730-35, when numerous corpses were disinterred in Hungary and Servia, and a multitude of writings appeared in Germany, both for and against the superstition.

The *ghouls* of the Persians and Arabians, subjects of a like credulity, have many points in common with the vampires of Europe, and traces of a similar belief have been found among the Polynesians, Malays, and Karens.

**VAMPIRE BAT** is the name given to several species of BATS (Chiroptera) belonging to the family Phyllostomidae, on account of their reputed habit of blood-sucking, and extended generally to embrace the whole family. The Phyllostomidae are remarkable for the presence of three distinct phalanges in the middle finger. The nasal appendages are sometimes rudimentary, but usually resemble more or less those of the Horse-shoe Bats (Rhinolophidae); from the latter family they are distinguished by the complete development of the premaxillary bones, and by the eyes being large and the tragus well-developed. The dentition varies, but the canine teeth are always large and sharp-pointed, and the molars in some have sharp cutting edges.

The vampire bats are peculiar to tropical America. They include both insectivorous and frugivorous species; some prefer a mixed diet of fruits and insects, and others are known to subsist, partially or entirely, by sucking the blood of other mammals. The accounts given by earlier travellers of the injuries inflicted by these bats seem to be somewhat exaggerated; but Darwin, Wallace, and Bates all show, by actual experience, that there are bats who suck the blood of horses, mules, cattle, and men. Men appear to be attacked chiefly at the tips of the great toes and the tip of the nose, other animals chiefly on the back and rump. The wound is superficial, and appears

to be made by removing, probably with the teeth, a small portion of the skin; a large number of the fine capillary vessels of the skin are thus cut through, insuring an abundant and long-continued flow of blood. The number of species having these bloodthirsty habits is not accurately known; one at least, *Desmodus rufus*, a native of South America, from Chili to Guiana, subsists entirely by sucking blood. This vampire bat measures about 4 inches in length and about 16 inches in expanse of wing; the fur is brownish. The incisor teeth of the upper jaw, two in number in the adult, are very large, triangular, and trenchant; the pre-molar teeth are small, sharp-edged, and furnished with a single root; true molars are absent. The stomach is very singular, the cardiac portion being developed into a very long cæcum, serving, it is considered, as a reservoir for the fluid food during the process of digestion. Another nearly allied species, *Diphylla ecaudata*, agrees with the *Desmodus* in its general characters, and probably also in its blood-sucking habits. It is probable that these two species are the only bats that wholly subsist on blood.

The species especially known as the Vampire Bat (*Vampyrus spectrum*) is, according to Bates ("Naturalist on the Amazon"), quite harmless, and feeds chiefly on fruits. It is the largest of the family, measuring 28 inches in expanse of wing. "Nothing in animal physiognomy," says Bates, "can be more hideous than the countenance of this creature when viewed from the front; the large leathery ears standing out from the sides and the top of the head, the erect spear-shaped appendage on the tip of the nose, the grin, and the glistening black eye, all combining to make up a figure that reminds one of some mocking imp of fable. No wonder that imaginative people have inferred diabolical instincts on the part of so ugly an animal."

The Javelin Bat (*Phyllotoma hastatum*), which is widely distributed over tropical America and the West Indies, is stated by Wallace and others to attack horses, cattle, and men, but only the remains of insects, without any traces of blood, have been found in its stomach. If it be a blood-sucking species it must only partake of this food occasionally, subsisting chiefly on insects. It is one of the largest of this family, measuring over 5 inches in length and nearly 23 inches in expanse of wing. The species of the genus *Stenoderma*, inhabiting the West Indies, Guiana, and Brazil, have also been suspected of blood-sucking, but probably without foundation, as they appear to feed altogether on seeds and fruits.

**VAN**, a lake of Asiatic Turkey, between Armenia and Kurdistan, 140 miles south-east of Erzeroum. It is embosomed among lofty mountains, and has no outlet; length, 70 miles north-east to south-west; breadth, 28 miles. It has an area of about 1413 square miles, and its elevation is 5120 feet. The depth in the centre is very great, but not ascertained; towards the shores it is comparatively shallow. The water is salt, but not a saturated solution of salt, like that of the Dead Sea, as has been often stated. It is so fresh towards the mouths of the few small rivers which enter it from the north and east, that cattle drink the water; and it contains in abundance one species of fish, a sardine, which has a rich flavour, and is largely used for food, being sent in a salted state to all parts of the country. It is not inhabited by any species of Mollusca. The rocks on the north, west, and south sides are of recent volcanic formation, extending hence in a broad band north-east to Ararat, 85 miles, and erupted through nummulitic (tertiary) limestones, which appear on the borders, and in the adjoining mountain ranges reach enormous heights.

**VAN**, a town of Turkey, the capital of a pashalic of same name, called by the Armenians *Schamiramakert*, or the town of Semiramis, is a mile east of the eastern shore of the lake. A plain, 4 miles broad, here reaches the east

margin, and the town stands on this plain, at the base of a rock of compact limestone, half a mile long, east to west, 400 feet above the plain, and very abrupt westwards. The citadel and eastern wall are on this rock, which has a highly picturesque and imposing appearance. It has several Armenian churches, mosques, well-supplied bazaars, and manufactures of cotton, which is imported from Persia. The surrounding country is productive, and has some interesting remains of antiquity. The population is about 45,000.

**VAN BUREN, MARTIN**, the eighth President of the United States of America, from 1837 to 1841, was born at Kinderhook, Columbia county, in the state of New York, on the 5th of December, 1782. He was trained early to the profession of the law, and in the twenty-first year of his age was admitted as an attorney to the bar of the state of New York. He advanced steadily in his career as a lawyer and as a politician, and after settling permanently in New York in 1807, he was elected a member of the state senate (1812), and in the following year member of the court for revision of errors. He was attorney-general of the state from 1815 till 1819, and became governor in 1820. In 1821 he was elected to represent the state of New York in the Federal Senate at Washington, where he sat with the Democrats. A staunch supporter of General Jackson, he became his secretary of state in March, 1828. In September, 1831, he arrived in London in the character of American ambassador. A few months later, when news reached London that the nomination of Van Buren as ambassador had been rejected by the Senate, Washington Irving, who was then chargé d'affaires, stigmatized the act as "a very short-sighted and mean-spirited act of hostility." Van Buren was made vice-president of the republic in 1832, during Jackson's second presidency; and in 1837 he succeeded his leader in the chair of chief magistrate, after a close contest with Clay, Webster, and Harrison. His administration was troubled by difficulties in finance, and in the international relations with England, which he succeeded in overcoming. He alienated his slave-holding supporters in the South by adopting the free-soil doctrines, and was baffled in all his subsequent attempts to obtain high office. In 1856 he retired from public life, and died on the 21th of July, 1862, in his eightieth year.

**VAN DIE'MEN'S LAND.** See TANMANIA.

**VAN EYCK, VAN TROMP, VAN DE VELDE, VAN DER WEYDEN.** See EYCK, TROMP, VELDE, WEYDEN.

**VANA'DIUM**, a rare metal discovered in 1830 by Sefström in the iron obtained from the ores of Taberg in Sweden. It is pretty widely distributed, but is only found in minute quantity. It is also present in the sun. It is found in combination with lead at Wanlockhead in Scotland, also in pitchblende, some ores of iron and copper, and in some clays. From the native vanadate of lead it is obtained by dissolving it in nitric acid and removing the lead and arsenic by sulphuretted hydrogen; the filtered liquid is evaporated to dryness, and the residue boiled with ammonium carbonate. The solution is filtered while boiling, and on cooling the ammonium-vanadate crystallizes out in needles, and from this the oxide may be prepared by ignition. The pure metal is obtained from the dichloride by reducing it in an atmosphere of hydrogen. Thus prepared it presents the appearance of a light gray powder, which, under the microscope, appears as a brilliant silver-white metallic crystalline mass. It is very infusible, but it oxidizes slowly in the air and burns brilliantly in oxygen. The specific gravity is 5.5. It forms an alloy with platinum. Vanadium belongs to the antimony group of metals. The atomic weight is 51.2; the symbol is V.

It forms four oxides—the dioxide ( $V_2O_2$ ), the trioxide ( $V_2O_3$ ), vanadium tetroxide or vanadium oxide ( $V_2O_4$ ), and



vanadium pentoxide or vanadic oxide ( $V_2O_5$ ). The dioxide may be prepared in solution by the action of nascent hydrogen on a solution of vanadic acid in sulphuric acid. The solution becomes blue, then green, and finally acquires a lavender tint; it absorbs oxygen more rapidly than any other substance, and bleaches indigo and other colours as quickly as chlorine. The trioxide is a black lustrous infusible powder, insoluble in acids. Vanadious oxide may be obtained from the trioxide, by exposure to the air, in blue crystals. It dissolves in acids forming solutions of vanadious salts, which have a bright blue colour, and give with an alkali a gray precipitate of hydrated vanadious oxide. This oxide also combines with metallic oxides, forming salts called vanadites, which are mostly insoluble. The alkaline vanadites are soluble salts, and the solutions heated with sulphuretted hydrogen develop a splendid purple colour, from the formation of a sulphur compound. Vanadic oxide is a reddish-yellow substance, sparingly soluble in water. It unites with bases forming salts, called vanadates; these are of three kinds, analogous to the phosphates, and are called orthovanadates ( $M_2VO_4$ ), metavanadates ( $MVO_3$ ), and acid vanadates ( $M_2V_2O_{11}$ , and  $M_3V_6O_{16}$ ). The mineral known as vanadite is orthovanadate of lead ( $Pb_3VO_4$ ), combined with lead chloride. The mineral dechanite is metavanadate of lead ( $PbVO_3$ ). Descloizite is diplumbic vanadate ( $Pb_2V_2O_7$ ). Vanadic hydrate or vanadic acid ( $H_2OV_2O_5$ ) is precipitated from solutions of alkaline vanadates by nitric acid as a light-brown flocculent precipitate. There are also four chlorides of vanadium, represented by the formulæ  $VOCl_3$ ,  $VOCl_2$ ,  $VOCl$ , and  $V_2O_2Cl$ . All are oxychlorides.

Two sulphides of vanadium are known, the tetrasulphide or vanadous sulphide ( $V_2S_4$ ), and the pentasulphide or vanadic sulphide ( $V_2S_5$ ).

Vanadium compounds are detected by giving, with borax, in the outer blowpipe flame a clear bead, which acquires a beautiful green colour in the inner flame.

Vanadic and chromic acids are the only two acids whose solutions are red, but the former becomes blue by oxidation and the latter green, which distinguishes them. Solutions of vanadic acid or acid vanadates, when shaken up with ether containing peroxide of hydrogen, acquire a red colour, the ether remaining colourless. This reaction is very delicate, and will detect the presence of one forty-thousandth part of vanadium.

Vanadic acid, in solution, gives a jet-black colour with tincture of galls.

**VANBRUGH, SIR JOHN**, an eminent architect and dramatic writer, was the grandson of a citizen of Antwerp, who left the Netherlands during the persecution of the Protestants by the Duke of Alva, and settled in England. He engaged in trade, and died in 1616, leaving considerable property to his son Giles, the father of Sir John. Giles Vanbrugh married the youngest daughter of the celebrated Sir Dudley Carleton, afterwards Earl of Dorchester. He was at first a sugar baker in Chester, where he is said to have died in 1689; but he gave up business, and was appointed comptroller of the Treasury. John, his second son, was born in 1666. He is supposed to have studied architecture in France. It has been suggested that his appointment in 1695 as commissioner for completing Greenwich Hospital, was made in consequence of his architectural knowledge; but it is quite as likely that he got his appointment through court interest, and made himself acquainted with its duties afterwards. Vanbrugh became first known to the public as a writer of comedies, his "Relapse, or Virtue in Danger" being acted for the first time, and with great applause, in 1697. It was followed by the "Provoked Wife," the "Confederacy," and seven or eight others. They are well-planned plays; the characters are truer to life than in most contemporary comedies (for instance, Lord Foppington and Miss Hoyden are types

whose frequent copies show the force of the original), and the wit, if less sparkling than Congreve's, is more flowing; but the situations and the sentiments are grossly licentious. Vanbrugh defended himself from the well-deserved censure of Jeremy Collier in "A Short Vindication of the Relapse and the Provoked Wife;" but when, some years after, the latter play was revived on the stage, he erased the most objectionable scene and modified other parts. Sheridan altered the "Relapse," and reproduced it in 1777 under the title of a "Trip to Scarborough;" but the inherent indecency and immorality of Vanbrugh's plays render the task of adapting them to modern tastes impracticable.

Vanbrugh's first great, and in many respects his most successful, architectural effort was Castle Howard, completed in 1703, for the Earl of Carlisle. With many obvious faults of detail, this is still one of the stateliest country palaces in England. It brought Vanbrugh abundant fame; and the earl, who was then lord-chamberlain, bestowed on the architect, as a mark of his satisfaction, the office of Clarenceux king-at-arms. He retained the office, and received the salary from this time, 1703, till a month before his death; but he knew nothing of heraldry, and the only duty he ever performed was that of signing official documents. Blenheim, Vanbrugh's other great work, was on a still more magnificent scale than Castle Howard—the entire block of buildings, including the attached offices, covering an extent of 830 feet. It was commenced in 1705, and completed in 1722. In it Vanbrugh put forth all his powers, yet the building was a source of infinite vexation to him. Blenheim was a portion of the national reward for the victories of Marlborough, and while the duke lived the course of the architect was comparatively smooth. But after his death the government withheld the funds for carrying on the works; and what was worse, the Duchess quarrelled with the architect, and though she followed his designs, employed another to complete the building. Nor did the design experience much more gentle treatment. Architects and critics denounced the building as a "hollowed quarry," in which appeared the style of no age and no country; a stupendous pile which defied all rules, and yet might outlast all record. And the wits, among whom Swift and Pope were conspicuous, were even less measured in their sarcasm than the critics. The mocking epitaph is still remembered for its pungent wit:—

"Lie heavy on him, earth: for he  
Laid many a heavy weight on thee."

It was not, indeed, till half a century later, when Sir Joshua Reynolds made Vanbrugh the subject of an elaborate eulogy in his Thirteenth Discourse, that anyone ventured a word in his favour. Opinion has now pretty well settled down on the subject. The grandeur of conception, massiveness, solidity, and picturesqueness are admitted; but it is felt that at Blenheim, still more than at Castle Howard, the parts are out of proportion, and that the whole is deficient in simplicity and repose. Vanbrugh erected a great many other country mansions—Eastbury, Dorsetshire; Grimsthorpe and Duncombe halls, Yorkshire; Seaton Delaval, Northumberland; King's-Weston, near Bristol; Oulton Hall, Cheshire, &c. He also built, and conducted as a joint-speculation, a theatre in the Haymarket, on the site of the present Italian Opera House. It was opened in 1706; but though Congreve was his partner and Betterton the manager, the speculation did not succeed, and Vanbrugh withdrew from it. Besides the appointment mentioned above, Vanbrugh was surveyor of Greenwich Hospital and of the royal gardens and waters, and comptroller-general of works. In this last capacity he, about 1722, put forth a plan for a complete system of sewerage, and the new paving of London. Queen Anne sent the insignia of the Order of the Garter to the Elector of Hanover (afterwards George I.) by Van-

burgh's hand, in 1702. He was knighted at the accession of George I. in 1714, and died at the house he had built for himself in Scotland Yard, Whitehall, 26th March 1726.

**VANCOU'VER**, a town on the mainland of British Columbia, opposite Vancouver Island. Its site was quite recently covered with forest, but it has rapidly come into importance on account of its having been chosen as the western terminus of the Canadian Pacific Railway. It stands on a magnificent bay, a few miles north of New Westminster, and although the first houses were all built of wood there are now several handsome structures of brick and stone, and the wharves present a busy scene when the vessels from China and Japan, California, Puget Sound, and Alaska are discharging or taking in cargoes. The chief articles sent eastward by the railway are teas, silks, sealskins, fish, &c. There are some extensive saw-mills near the town, and large quantities of timber are exported. In Vancouver Island opposite are extensive coal mines, from which nearly all the steamships of the Pacific are supplied.

**VANCOU'VER ISLAND.** See BRITISH COLUMBIA.

**VANCOU'VER, GEORGE**, a British navigator, was born about 1756. He entered the navy at an early age, and sailed as midshipman with Captain Cook on that navigator's second and third voyages. Shortly after the return of that last expedition (1780), Vancouver was raised to the rank of lieutenant. He served subsequently in the West Indies, where he remained until 1789. In 1791 he set out in the *Discovery*, accompanied by the *Chatham*, to receive the surrender of Nootka from Spain, and to explore the north-west coast of America. Few undertakings of the kind have been attended with more complete success, and none more thoroughly attest the talents, industry, and high nautical skill of those engaged in its conduct. On his way out Vancouver surveyed a portion of the south coast of Australia, discovering and naming the inlet of King George's Sound. He afterwards examined portions of the New Zealand coasts, and made some discoveries in the great ocean which stretches to the eastward of that region. The north-west coast of America was, however, the chief theatre of his labours. With untiring industry he devoted the greater part of three years (1792-94) to an elaborate survey of the numerous islands, intervening channels, and intricate coast-line, which belong to the western side of North America between the parallels of 48° and 60°, passing the two intervening winters at the Sandwich Islands. In the course of this undertaking, which extended over 9000 miles of coast, Vancouver found that the supposed strait of Juan de Fuca, instead of forming a communication across the American continent, conducted into an extensive and winding channel, the Gulf of Georgia, which divides from the American mainland the island upon which Nootka is situated. A Spanish officer, Quadra, co-operated with the English navigator in examining the coasts of this island, now, under the name of Vancouver Island, the seat of a flourishing British colony. He returned to England in 1795, and devoted the remainder of his life to preparing for publication an account of his labours, accompanied by the charts which constitute their most valuable fruit. He died in May, 1798, when his work, a "Voyage of Discovery to the North Pacific Ocean," &c. (three vols. 4to, London, 1798), nearly approached completion, the final additions to it being made by the pen of his brother John.

**VAN'DALS** (Lat. *Vandali*, *Vindili*), a name frequently mentioned in early history, as applied to one wave of those ruthless invaders of Western Europe who were mainly instrumental in overthrowing the Roman power. They were of Teutonic origin, and resided, when first we meet them in history, along the shores of the Baltic, west of the Vistula. It is true that Prokopios, the historian, asserts

that they previously had settlements around the Sea of Azov; but, as he confesses he regards them as Goths, his evidence is not to be taken unsupported. We will therefore start with them as neighbours and kinsmen of the Burgundians along the lower Vistula and the Baltic. Hence the Vandals moved southward, and took part in the second century with the Marcomans and Quadi in the famous campaign which robbed us of the saint of paganism, the great and good Emperor Marcus Aurelius (180). In the next century we find them settled along the Danube in Dacia (the modern Roumania), neighbours of the Goths and Dapidae. Incessant tumults arose in which the Vandals got the worst, and eventually the Emperor Constantine had them removed westward to Pannonia, the modern Styria. Here they flourished for half a century. Then they joined the great German invasion of Gaul with the Suevi and other confederations, and at the beginning of the fifth century, Gaul having been thoroughly wasted and plundered, the Vandals broke off from most of the other German tribes, and with some few allies of the Suevi crossed the Pyrenees into Spain. They overran and thoroughly conquered this country, and have left permanent traces of their conquest in the name of Andalusia (*Vandalitia*). Well-organized veterans of several campaigns as they now were, the Vandals under Genseric made a considerable force; and in the bitterness of hate and jealousy at the favours accorded by the Emperor Valentinian III. to the great general Aetius, his rival Bonifacius, governor of Africa, now looked upon them as an instrument towards the easy overthrow of the Roman power. In 429 he invited them to cross to Africa, and they accepted the traitorous call, passing over the Straits of Gibraltar to the number of 80,000 warriors, exclusive of non-combatants. Bonifacius repented of his treachery, but it was too late. Genseric, at the head of his splendid army, ravaged Africa (i.e. the only part of the continent then civilized, the shores of the Mediterranean) from the pillars of Herakles to the deserts bordering Egypt. As he proceeded eastward he was joined by the great Arian sect of the Donatists, then much persecuted by the Catholics. Genseric was himself an Arian Christian (save the mark!) and was quite ready to help the Donatists to become persecutors in their turn. As soon as Bonifacius began seriously to oppose him, Genseric drove the Romans into Hippo (the modern *Bona*) on the coast of Numidia, a town ornamented by the episcopate of St. Augustine. During the long siege which followed, St. Augustine died (430). After fourteen months of much privation Bonifacius made a desperate sally, and was utterly defeated. Genseric was now recognized as king of the great Vandal dominion of the whole of North Africa by Valentinian III., and a treaty was formed. Besides this immense territory Genseric ruled over the great islands of the Mediterranean, Majorca and Minorca, Sardinia and Corsica, and part of Sicily. Year by year this great Teutonic power of the south grew in strength and solidity, and finally in 455 Genseric made a push for universal dominion, in a raid on Italy. Gibbon gives authority to a statement found in some of the ancient historians, that Genseric was invited to Italy by the Empress Eudoxia herself. She, the consort of Valentinian III., had been forced to marry his murderer and successor Petronius Maximus, and it is certain that as soon as the Vandals landed at Ostia the unfortunate usurper was stoned to death in the streets, and his body cast into the Tiber. Rome fell almost without a blow, and Pope Leo (St. Leo the Great) hastened to implore the mercy of the conqueror. Leo had prevailed with Attila a few years before, but his pleading fell upon a deaf ear when addressed to Genseric and the Vandals. For fourteen days, except a few chaplains thrown to the saintly pope as contemptuously as a bone to a dog, Rome was sacked by the Vandals and their followers the Moors. What

seemed not useful for pillage was burned. The fine bronze statues of pagan times, the silver crucifixes of the Christians, the holy golden table, seven-branched candlestick, &c., of the Jews, brought to Rome in the first century by the Emperor Titus from Jerusalem, these were taken away in the Vandal ships. Gorged with plunder, and slaves, among them Eudoxia herself, Genseric returned to Africa. The great Gothic king Theodoric had raised Avitus to the purple, and was ready to advance, and Genseric wisely judged that Italy was not for him. The brutal way in which the Vandals destroyed what they could not carry off, and even what they did carry off (melting down the most priceless works of art for their mere metal), has stigmatized them for all time, and given *Vandalism* as a new word to succeeding dictionaries.

Genseric died in 477, but the kingdom continued under Hunneric his son. Guntamund, nephew of Hunneric, succeeded in 484, and Thrasimund, another nephew, in 496. Hilderic, son of Hunneric, now succeeded in 523, but as he leaned towards Catholicism he was deposed by his Arian subjects in favour of his uncle, Gelimer, in 530. By this time the nation was much enfeebled through the enervating influence of riches, and of the climate of sunny Africa. Belisarius, the great general of the Emperor Justinian, saw the chance, and taking advantage of a proffered assistance from the party of the deposed Hilderic he was despatched by Justinian with a strong army in 533. Hilderic was found out and put to death, but traitors were not wanting, and Belisarius had an easy conquest. Gelimer, who had fled into the Numidian desert, was soon captured, and was carried in the train of the victorious general to Constantinople. He died not long after in Asia Minor. The Vandals were received into the Roman army, as many as would, and Africa became once more nominally a Roman province. Those who remained were soon absorbed into the various peoples of the Mediterranean southern shores, and the name of the once mighty nation disappeared from history for ever.

**VAN'DERBILT, CORNELIUS**, a celebrated American capitalist, was born on Staten Island, New York, 27th May, 1794. He came of humble Dutch parentage, and after receiving a meagre education he turned waterman, and bought a boat with which he plied between the island and New York. From this small beginning he gradually acquired other boats, sloops, and schooners, and though he married at the age of nineteen, by twenty-three he had accumulated a capital of 9000 dollars. In 1817 he assisted Thomas Gibbons in building the first steamboat ever run between New York and New Brunswick, and became captain of her at a salary of 1000 dollars a year. In 1821 he took command of a better boat, and having established his wife in an hotel at New Brunswick, he rapidly accumulated money. In 1824 he had full control of the Gibbons line; in 1827 he leased the ferry between New York and Elizabeth port, New Jersey; and in 1829, having left Gibbons, he started steamboats of his own in competition to the existing lines on the Hudson, on Long Island Sound, on the route to Boston, and on the Delaware from Bordentown to Philadelphia. In 1850 he started, in a new steamboat that he had built, for the isthmus of Darien; here he established a new transit route, running three steamers on the Atlantic and four on the Pacific, in competition with the companies then existing. In 1855 he started an independent transatlantic line, but he abandoned it in 1861, giving the steamer called the *Vanderbilt*, which had cost 800,000 dollars, to the government on the outbreak of the Civil War. During his steamship career his entire steam fleet numbered sixty-six vessels, his popular title being the "Commodore," and when he retired from marine enterprise his accumulations were estimated at 40,000,000 dollars. The remainder of his career was devoted to railway enterprise, and as the chief proprietor and manager of the New York

Central line and the president of three other important companies, he became one of the foremost citizens of the Union. He was a hard, keen, and unscrupulous man, and by means of his vast wealth he kept Wall Street in awe, his huge fortune increasing by leaps and bounds until his death at New York on 4th January, 1877. He gave during his lifetime 1,000,000 dollars for the organization and endowment of a central university of the Methodist Episcopal Church, South, which was called after his name, and opened in October, 1875.

**VANDYCK' or VAN DYK, SIR ANTHONY** (Antoon), one of the greatest of modern portrait painters, ranking with Titian, Velasquez, Holbein, Rembrandt, and Rubens, was born at Antwerp on the 22nd of March, 1599. His father, Franz, was a respectable merchant, and Antoon was the seventh of twelve children, but he had the misfortune to lose his mother, Maria Cuypers, in his eighth year. When only ten years old he had already commenced his career as a painter, having become the pupil of Henry van Balen in 1609; he afterwards became the pupil of Rubens. In 1618 he was admitted into the guild of St. Luke as a master, though not then of age. In the spring of 1620 he was still working under the direction of Rubens, and also as his assistant, and in 1621 he was in London working for James I. In 1623, by the advice of Rubens, Vandyck set out for Italy, and spent four or five years studying in that country, chiefly at Genoa; but he visited also Venice, Florence, Rome, and Palermo. He painted many portraits in Italy, and they are all very carefully elaborated. In 1626 he was again busy in his native city. In 1628 he painted an altar-piece for the church of the Augustines, and in 1629 he presented a picture of the crucifixion to the Dominicans of Antwerp, a memorial gift in honour of his father. This picture is now in the gallery of the Antwerp Academy. When in 1631 Vandyck became acquainted with the Countess of Arundel, who invited him to England. He visited this country a second time in 1630-31, but not meeting with the encouragement he expected he returned to Antwerp. However, in 1632 he received an invitation from Charles I. himself to visit England. He came, and was on that occasion worthily received. He was lodged by the king at Blackfriars, and was granted a pension of £200 a year, with the title of painter to his Majesty. He was knighted in 1633. Vandyck spent the remainder of his life in this country, and certainly had a brilliant career as a portrait painter. "He always went magnificently dressed, had a numerous and gallant equipage," says Graham, "and kept so good a table in his apartment that few princes were more visited or better served." He had a country house at Eltham in Kent, where he spent a portion of the summer. About 1640 he married Mary Ruthven, granddaughter of the unfortunate Lord Ruthven, earl of Gowrie—a beautiful girl in the service of Queen Henrietta; and in this year Vandyck visited his native country with her, and afterwards went to Paris, where news of the English revolution hastened his return home. On the 1st of December, 1641, was born his only child, a daughter, and eight days afterwards (on the 9th) Vandyck died in London, in his forty-third year, and was buried in Old St. Paul's, near the tomb of John of Gaunt. Notwithstanding his expensive style of living, Vandyck left property to the value of about £20,000 sterling. His widow married again, and his daughter Justiniana was twice married. He had also a natural daughter at Antwerp, Maria Theresa, for whom he made a proper provision in his will. Of the many magnificent portraits painted by Vandyck, most of the finest are in this country, especially at Windsor Castle. At Warwick Castle, and at Coome Abbey, are also some fine examples. The National Gallery possesses one of the finest heads in the world, which is ascribed to Vandyck—the portrait of Cornelis van der Geest, erroneously called Gevartius; also a superb portrait of Rubens, and an excel-

lent one of himself. The number of portraits by Vandyck scattered over England is prodigious. In 1866 seventy-two were with ease brought together in one exhibition in London, and in 1887 nearly 200 Vandycks were shown at the Grosvenor Gallery, but these were not all portraits.

But perhaps the grandest, if not the most perfect portrait Vandyck ever painted, is the colossal "Charles I. on horseback," long the chief ornament, save only for the incomparable *Ansidei* Madonna of Raffaele, of the Blenheim Gallery of the Marlboroughs. Like the Raffaele, the Vandyck was purchased for the nation at the Blenheim sale in 1881. The Raffaele fetched £70,000, and the Vandyck £17,500, but fabulous as these sums appear they are justified, in the opinion of connoisseurs. The National Gallery can now fairly boast pre-eminence in the works of this master. As for the famous portrait, it was originally, no doubt, painted for the king, and was sold during the Commonwealth for £150. Another equestrian portrait of the king on a white horse, passing under an arch, which is now at Windsor, was sold on the same occasion for £200. A third equestrian portrait, probably a copy, was sold for £40. The great Duke of Marlborough bought the Blenheim portrait at Munich. In the British Museum is a fine sketch for the trees in the background. The National Gallery painting is on canvas, in excellent condition, and shows the king bare-headed, otherwise in complete shining black armour, mounted on a dun-coloured horse, seen in profile advancing to the left, and attended by his equerry, Sir Thomas Morton, on foot, and holding the royal helmet. On a richly framed tablet suspended from a tree is written CAROLVS. I. REX. MAGNE. BRITANIE. In the king's ear hangs the large pearl it was his custom to wear, which, after his execution, was given to the Princess Royal. Mr. Scharf tells us that Queen Mary of Orange authenticated this jewel in her own writing; William III. gave it to the Earl of Portland; it is now in the possession of the Duke of Portland. Though many more pictures than the *Ansidei* Raffaele and this Vandyck ought to have been secured for the nation from the Blenheim collection, it is evident that even the treasury of England would hardly suffice to purchase many such *desiderata* at the rates in vogue. The portrait is a superb masterpiece, a splendid example of Vandyck's art at its most potent stage. The painter never imparted to the cold, hard, narrow, and proud features of Charles a grander and more king-like expression than we notice in the face of this glorious work. The horse is perhaps the best Vandyck produced, which is saying much. The sky and the abundant foliage would have charmed Titian. The general colouration and handling attest the profit gained by Vandyck during his sojourn in Italy. The picture, though often copied, has never been adequately engraved.

Besides portraits, Vandyck painted many religious subjects, one of the most famous of which is "Christ taken down from the Cross," now at the Antwerp Academy, and another, a Crucifixion, in the Cathedral of Mechlin. The "Betrayal of Christ" in the Madrid Gallery is also very fine.

**VANE, SIR HARRY,** the Younger, one of the most influential statesmen of the time of the Commonwealth, was born in the year 1612. He was the eldest son of Sir Henry Vane (1589-1654), afterwards Baron Vane of Baby Castle, who filled several high offices of state under James I. and Charles I., and of Frances Darey, a lady of an old family in Essex. He was educated at Westminster School and Magdalen College, Oxford, but before matriculation he came under the influence of Puritanism, and refusing to take the oaths of allegiance and supremacy he quitted Oxford for Geneva. On his return to England his openly avowed hostility to the Church of England involved him in difficulties with his father, who invoked the aid of Laud, then bishop of London, and young Vane resolved for conscience sake to settle in the American colonies. Quitting England he landed at Boston in 1635, and the following

year he was elected governor of the colony. He was, however, too republican and independent for the colonists, and he gave great offence by interfering in the interests of liberty and toleration, in a bitter religious dispute then being waged by Winthrop, the founder of the colony, with the clergy, against Mrs. Anne Hutchinson and her followers. In consequence of this he was ejected from office in 1637, and the same year he returned to England. On his arrival in England he married, and through his father's interest he procured the office of treasurer of the navy, in conjunction with Sir William Russell. In 1640 he was knighted, and the same year he was twice elected member for Kingston-upon-Hull, the second election being for the Long Parliament. In Parliament he was soon recognized as one of the principal leaders of the popular side, and he took a prominent part in the proceedings against Lord Strafford. After the execution of that nobleman, the name of Vane appears prominently in all the important measures brought forward by the leaders of the Parliament, especially in measures of religious reform. It was he who carried up the impeachment against Laud, and he went hand in hand with Pym and Hampden in the punishment of the tools of the king in his unconstitutional proceedings, the destruction of arbitrary courts, the constitutional settlement of taxation, and in all their other measures of reform. When the final appeal to arms was made Sir Henry surrendered his patent of treasurer of the navy, and though he was reappointed sole treasurer by the Parliament, he handed over to the latter the fees of the office (which, by reason of the war, amounted to £30,000 a year), only desiring that £2000 a year should go to a deputy whom he had trained to the business. Vane was one of the commissioners sent to Scotland in 1643 to solicit the assistance of the Scottish nation in the contest with the king, and was mainly instrumental in framing the Solemn League and Covenant, which brought 20,000 men into the field, and contributed largely to the triumph of the Parliament. He was a zealous opponent of the Presbyterian party, and was regarded as one of the leaders of the Independents, but he disapproved of the expulsion of the Presbyterian members by the army, and of the execution of the king. Shortly before the latter event he retired for a time from public life, but upon the establishment of the Commonwealth he was appointed one of the council of state; and in 1652 was for a time president of the council, and at the same time one of the commissioners of the navy. Towards the end of 1651 he was nominated one of the commissioners to be sent into Scotland, in order to introduce the English government there. His republicanism, however, was far too thoroughgoing to permit of his acting in concert with Cromwell, and when the latter forcibly dismissed the remnant of the Long Parliament, Vane said aloud, "This is not honest; yea, it is against morality and common honesty;" to which Cromwell replied, "Sir Harry Vane, Sir Harry Vane, the Lord deliver me from Sir Harry Vane!" During the remainder of Cromwell's career Sir Henry lived in strict retirement, devoting himself chiefly to philosophical and religious studies. In 1656 a pamphlet against Cromwell, entitled "A Healing Question Propounded and Resolved," led to his imprisonment in Carisbrook Castle, in the Isle of Wight. He speedily regained his liberty, but remained to the end an inflexible opponent both of Oliver Cromwell and his son Richard. After the abdication of the latter, Vane assisted in resuscitating the Long Parliament, and was appointed a member of the Committee of Safety, and also a member and afterwards President of the Council of State. But as the House inclined towards monarchism he lost favour, and was banished for a time to his residence at Baby.

On the Restoration of Charles II. Vane was still in retirement, and, trusting to the general amnesty declared by

the king, he made no attempt to escape. But his name was included among the twenty persons excepted out of the Act of General Pardon and Oblivion, and in February, 1660, he was arrested and imprisoned in the Tower. The House of Commons requested that his life might be spared, and the king promised to comply with this request; but after Vane had been moved from prison to prison for two years, he was put upon his trial for high treason in June, 1662. The proceedings of the court exhibited a scandalous violation of law and justice; and though Vane, who had been denied the assistance of counsel, defended himself with great ability, spirit, and courage, he was found guilty, and sentenced to be hung, drawn, and quartered. The king had determined on his death, and in a letter to Clarendon he expressed his opinion that Vane "was too dangerous a man to let live if he could be honestly put out of the way;" but he altered the sentence to one of simple beheading, and in this way the indomitable patriot was put to death on Tower Hill on 11th June, 1662. His bearing at the last was dignified and manly, and such was the fear of the authorities that his last words to the people were drowned by the blare of trumpets, lest he should dangerously excite the sympathies of the people.

Sir Henry Vane was undoubtedly one of the ablest and most accomplished statesmen of the Commonwealth, and his disinterestedness and integrity were above suspicion; but he was at the same time crotchety, impracticable, and somewhat fanatical in religious matters.

He was the author of numerous publications, both political and theological. Of the latter the most remarkable is "The Retired Man's Meditations," &c., an elaborate work illustrative of his views of religion and philosophy. His biography has been written with much ability by John Forster, "Lives of Eminent British Statesmen," vol. iv.

**VANESSA** was the poetical name bestowed by Dean Swift on Miss Esther Vanhomrigh, whose unhappy attachment for him, when she—poor child!—as he says,

"Not in years a score,  
Dreams of a gown of forty-four,"

is one of the most famous tales of our literature.

In 1710 Swift made the acquaintance of Mrs. Vanhomrigh, widow of a Dutch merchant of Amsterdam, who became a commissioner of revenue and a commissary in Ireland under William III., and who had left her in easy circumstances. There were two daughters and two sons. The lodgings of the Vanhomrighs were close to those of Swift, and their drawing-room was full of pleasant company, such as he loved, so that he became very intimate there. His best wig and best gown were often left there. Always fond of cleverness in girls, Swift took great interest in the studies of the young ladies, and by 1712 discovered to his great regret that the eldest, Esther, then nearly twenty, had fallen in love with him. He affected not to perceive it, and hoped to restore the former relations between them, but the unhappy girl ended by throwing herself at his feet and avowing her passion. It was then that Swift, instead of at once leaving her, and cutting deep like a humane surgeon, sought to calm the passion he had unwittingly aroused by that most exquisite, most graceful, and most original poem ("Cadenus and Vanessa"), from which a line was quoted above. Miss Vanhomrigh was Vanessa, the dean (*decanus*) was Cadenus. Had Swift never written anything else he would by this piece have immortalized himself, and by it he has immortalized poor Vanessa. Swift did not succeed in curing his fair patient, and then, when too late, he did what he should have done at first, firmly desired that the acquaintance should cease.

In 1714 Mrs. Vanhomrigh died, leaving her affairs in some embarrassment. The sons quarrelled with the daughters, and the latter, on the score of old friendship, asked the dean to help them, which he kindly did. Esther inherited some Irish property near Dublin by the terms of

her father's will, and being no longer tied to England she suddenly announced that she should come and live at Dublin, where Swift was dean of St. Patrick's Cathedral. Swift was very angry, and pointed out the extreme indiscretion of the step, as their names had been publicly connected. "If you are in Ireland while I am there," said he in one of his letters, "I shall see you very seldom." Her letters are affecting, even now, in their pitiable abandonment. She tells him, for instance, how near she has been to suicide. Swift's replies are most kind and delicate. Finally Miss Vanhomrigh left Dublin for Marley Abbey at Cellbridge, not far distant. The correspondence continued but became less familiar; finally there clearly was a quarrel of some kind, and lastly, in 1723, the ill-fated young lady died. There is reason to believe that she resorted to the fatal aid of stimulants to dull her pain, and it may be that some unforgivable expression escaped her.

The tale told by Dr. Sheridan, Swift's intimate friend, and stamped with the approval of Sir Walter Scott, though it is manifestly incapable of absolute proof, is that Vanessa's journey to Ireland was determined upon by her in order to penetrate the secret of the close friendship (was it more? was it engagement or even marriage?) with Miss Esther Johnson, Swift's "Stella," and endeavour to overcome her rival. Swift, it is said by Scott, tried all means to end the distressing situation, even introducing eligible gentlemen to Miss Vanhomrigh in Dublin, hoping thus to divert her affections from himself. It was in vain, and the death of her sister and counselor left Vanessa, in 1720, a prey to what had become a monomania. In these circumstances she wrote to Stella, asking her point-blank whether or no she was married to the dean, and Stella handed the letter to him. He rode at once to Miss Vanhomrigh at her house of Marley Abbey, and turning upon her a countenance full of indignation (*sæva indignatio*), which he of all men was best able to assume, he threw her own letter before her on the table and left her without a word. The poor lady fell mortally ill, and in a few weeks died of a broken heart; if ever such a phrase is permissible, it surely is so in her case. She revoked a will in which she had left all she possessed to Swift. Orrery tells the same tale with the exception that the fatal letter was written to Swift himself and not to Stella.

While it is impossible not to pity Miss Vanhomrigh, it is evident that Swift is blameless in this most unhappy affair, if we accept his own and Stella's positive assurances that there was no love-tie between them. Otherwise it was his manifest duty to tell Miss Vanhomrigh of his marriage to Stella, if marriage there were, or of his promise to her, if promise there were. It is said in the Scott legend that Stella really gave some such foundation to the unhappy lady in replying to her rash letter. If that is so there are many who would give much to know now what poor Vanessa knew too late. It is, however, practically certain that Swift was never married.

**VANGUERIA** is a genus of plants of the order RUBRACEÆ. The species are few in number; the principal are *Vangueria edulis* of Madagascar, and the Indian *Vangueria spinosa*. The fruit of the former is eaten by the natives of Madagascar. In the Mauritius, where it has been introduced, the Creoles use the leaves in dysentery and as external applications in hernia. The species are shrubs, with white bell-shaped flowers and succulent fruit. Several are cultivated in this country as stove-plants.

**VANHOMRIGH, ESTHER.** See VANESSA.

**VANILLA** is a genus of plants belonging to the order ORCHNIDEÆ, the fruit of which forms the vanilla of commerce. About twenty species are known from the tropics of both hemispheres. They are remarkable among orchids for their climbing habit, the slender twining stems emitting aerial roots, by means of which they climb upon trees to a height of 20 or 30 feet. The leaves are oblong, fleshy

and heart-shaped at the base. The flowers are in racemes or spikes, and are large, thick, fleshy, and dull-coloured. The fruit is a pod-like fleshy capsule, one-celled, with numerous seeds.

The vanilla of commerce is chiefly obtained from *Vanilla planifolia*, a native of the warmer parts of Mexico, which is cultivated in Central and South America, and in some parts of India. It was introduced into this country in 1800. As it very rarely flowered and never produced fruit in Europe, it was never suspected to be the plant that yielded the vanilla of commerce, until M. Morren, of Liège, succeeded in obtaining abundance of fruit from this plant. As used in commerce, the vanilla pods or beans are fleshy flexible sticks, 3 to 8 inches long, and less than half an inch thick; the surface is furrowed longitudinally, and is often covered with minute crystals; within is a soft black aromatic pulp, in which are embedded minute black seeds. Vanilla has a balsamic odour, warm taste, and an agreeable flavour. For these properties it is indebted to a crystallizable principle, called vanillin, which is contained in the pods either in the form of crystals or dissolved in the viscid pulp. The pod is gathered when it gets yellow, and is first allowed to ferment for two or three days; it is then laid in the sun to dry, and when about half dried is rubbed over with oil; it is again exposed to the sun to dry, and oiled again a second time. It is then collected in small bundles, and wrapped up in the leaves of the Indian reed. Neither in Guiana nor in Mexico is the vanilla plant cultivated, but the fruit is collected by the natives, who sell it to the Europeans. It is chiefly used in the manufacture of perfumery, and for flavouring chocolate, ices, sweetmeats, &c.; but it is also much employed on the Continent medicinally as an aromatic stimulant and neurotic. It is chiefly exported from Vera Cruz. It is much adulterated with Tonka bean.

**VANILIN** is the neutral principle of the Vanilla (*Vanilla planifolia*, natural order Orchidaceæ). It is a very fragrant body, which crystallizes in colourless prisms, having the formula  $C_{10}H_{10}O_2$ . It is insoluble in cold water, more soluble in hot water, very soluble in alcohol and ether. It has been also prepared artificially from oil of cloves.

**VANI NI, LUCILO** (or, as he called himself on the title-pages of his books, *Julius Cesar*), one of the martyrs of freethought, was born at Taurisano, near Otranto, in 1581. After studying at Rome and Padua, he joined the order of the Carmelites, and wandered through Switzerland, Germany, the Netherlands, and France, studying philosophy and everywhere attracting attention by his preaching and public controversies. Threatened by the Inquisition, he fled to England, where he was admitted a member of the Church of England. He afterwards went to Genoa, and from thence to Lyons, where in 1615 he published his "*Ampitheatrum Æternæ Providentiæ*," &c., a curious argument against various forms of atheism, which, however, caused him to be suspected of a desire to spread atheistic doctrines under a pretence of opposing them. In Paris he published in the following year his volume of dialogues, "*De Admirandis Naturæ, Regniæ Dæmonis Mortalium, Arcanis*," which after being sanctioned was burned by order of the Sorbonne. Soon after its publication he went to reside at Toulouse, then a hotbed of ecclesiastical bigotry, and here he was soon arrested on a charge of heresy. Tried by the *parlement* of that city, of which Gramont was the president, he was found guilty of atheism and sentenced to be burned alive—a sentence which was executed on 19th February, 1619, with every aggravation which the most refined cruelty could suggest. See "*La Vie et les Sentiments de L. Vanini*," by David Durand (Lutetia, 1717), and "*Œuvres Philosophiques de Vanini*," by Bonssot (Paris, 1811).

**VANLOO, JEAN BAPTISTE**, was born at Aix in Provence in 1684. His grandfather, Jacques, was skilful in

portraiture, and his father, Louis Vanloo, excelled in design and was a good fresco painter.

Although much occupied with portraits, in which branch he received the highest patronage, Vanloo applied himself also to historical pieces. In 1731 he was made a member of the Academy, and in 1735 appointed professor. Very soon after this he lost heavily in the Mississippi scheme, and to restore his fortune he came, in 1737, with two of his sons to London, and met with great favour from Sir Robert Walpole, who introduced him to the notice of the nobility. He painted many portraits in England. He retired to Provence in October, 1742, and died there in April, 1746.

Vanloo had five sons, one of whom, Louis Michel, became painter to Philip V., king of Spain; and another, Charles Amadée Philippe, painter to Frederick the Great of Prussia. His brother, Charles André—usually called Carle Vanloo—also became a member of the French Academy. He was appointed principal painter to Louis XV. in 1762, and director of the Academy in 1763. He died in 1765. He had great natural abilities, perhaps even beyond those of his brother, Jean Baptiste, but, like him, was spoiled by the false taste of the age.

**VANNES**, a town of France, in the department of Morbihan, at the head of an inlet on the coast, 6½ miles north-west of Nantes. It was formerly the richest and most populous town of Armorica, but is now an old-fashioned gloomy place, surrounded by walls. It has a cathedral, rebuilt in the fifteenth century, a library of 8000 volumes, and other institutions, and though the harbour is small some shipbuilding is carried on. There are manufactures of linen, cotton, and woollen goods and lace. The population in 1886 was 14,042. It has been supposed that Vannes occupies the site of Doriogium, the capital of the Veneti, but the better opinion seems to be that the latter was about 5 miles north by west of Vannes, where the remains of a circus and Roman road are still extant.

**VANNUC'CHI**, probably the family name of Andrea d'Agnolo or del Sarto (i.e. Angelo or Agnolo, the tailor's son), a famous painter. See SARTO.

**VANNUC'CI, PIETRO**. See PERRUGINO.

**VAPOUR**. When a solid or liquid body, in consequence of being exposed to an elevated temperature, becomes for the time being aeriform, it is termed a vapour. It is, in short, a gas, for since nearly every gas (as oxygen, hydrogen, &c.) has now been not only liquefied, but solidified, it follows that a gas is merely the vapour of a body which at lower temperatures than that of the earth's atmosphere would appear as a liquid or solid, whilst a vapour, in like manner, if the atmosphere were of a higher temperature, would be considered as a gas. The distinction between the two is, therefore, merely relative. The commonest of all vapours is steam, the vapour of ice (solid) or of water (liquid).

**VAPOURS**, a disease especially afflicting ladies, known to our grandmothers and great-grandmothers, but now either extinct or called by other names. It seems when genuine to have been an effect of nervous debility, in some forms of which a variety of strange images float in the brain, or appear as if visible. But in actual fact mere hypochondriacal affections, ennui, and spleen were probably the usual "vapours" of the old books.

**VAR**, a department in France, consisting of a portion of Lower Provence, is bounded N. by Basses-Alpes, N.E. by the newly-formed department of Alpes-Maritimes, S. and S.E. by the Mediterranean, and W. by Boucles du Rhône. The department was named from the Var, which was formerly its chief river, and served as its boundary on the east, but it now belongs entirely to the department of Alpes-Maritimes. The area is about 349 square miles, and the population in 1886 was 283,683.

*Physical Aspect*.—The coast of Var is rocky, indented



by several bays and skirted by numerous islands. The principal bays are those of Antibes, Fréjus, Hyères, Giens, and Toulon, some of which present a low sandy shore. Of the islands, several of which are fortified, the most important are the Hyères group and the Isle of Sainte Marguerite, opposite Cannes.

The department is mountainous. A branch of the Alps extends from east to west through it, forming the watershed between the Durance and the Mediterranean. Another range parallel to the above extends along the coast between Hyères and Fréjus, separating the shore from the coast of the Argens, which river, after draining the valley, turns south-east, and flows past the eastern extremity of the range into the Mediterranean, near Fréjus. The mountains along the coast contain granite and clay slate; the range north of the valley of the Argens is chiefly calcareous, but in both hills are met with containing sand, gravel, fossil shells, carboniferous deposits, and volcanic products.

*Minerals, Hydrography, &c.*—Among the minerals of the department are iron, lead, manganese, coal, lignite, marble of various colours, alabaster, porphyry, granite, serpentine, jasper, and gypsum. Mining having proved unprofitable, has been generally abandoned. There are salt-works on the sea-shore, especially at Hyères.

Var is well watered, but the rivers are small and not navigable, with the exception of the Argens. The Gapou or Gapeau in the west, the Argens in the centre, and the Siagne and Loup in the east flow into the Mediterranean, and with their several tributaries belong wholly to this department. The Verdon, which flows into the Durance, forms in one part the northern boundary. The Durance itself just touches the north-west corner. Lagoons of considerable extent are found near the coast, the chief of which are those of Pesquier in the Isthmus of Giens, and those of Napoule and Villepoy, near the eastern limit. There are railways from Marseilles to Toulon, and from Toulon to Nice.

*Climate, Soil, and Products.*—The climate is, for the latitude, temperate; the winters are mild except when the mistral blows. The south east wind is very relaxing. The soil is by no means favourable, taken as a whole, however fertile particular spots may be, and from the hilly nature of the country cultivation is carried on chiefly by manual labour. There is a considerable extent of open pasture; in summer, however, the grass is so scorched up that the sheep, which are numerous, are sent at that season to feed in the mountain pastures of the department of Basses-Alpes. Goats, mules, asses, and pigs are numerous. Among the wild animals are wolves and foxes, and game is abundant. The vine and the olive are cultivated in terraces on the slopes of the hills. The pomegranate, citron, lemon, orange, almond, and fig thrive in the open air; the plum and the peach are grown and preserved for exportation, and the caper and the jujube are cultivated. The mulberry is extensively reared, and silk and tobacco are produced in considerable quantities. The woodlands yield firs equal to those of the north of Europe, cork trees, and the *kermès oak*. Odoriferous plants, the rose, jasmine, heliotrope, &c., are greatly cultivated for making essences and perfumes. A great number of bees are kept, which produce exquisite honey.

The tunny, anchovy, and sardine fisheries are actively carried on along the coast. The manufactures are coarse woollen cloth, perfumery, liqueurs, confectionery, olive oil, soap, corks, leather, brandy, silk twist, paper, glass, pottery, and salt of lead. The exports are chiefly wine, fruits, olive oil, and horticultural products.

The department is divided into the three arrondissements of Draguignan, Brignoles, and Toulon. The capital of the arrondissement of Draguignan and of the whole department is DRAGUIGNAN.

**VA'RA**, the Spanish yard, which, in Castile, is equal to 0·925 of an English yard; and this standard still prevails in those states which belong, or formerly belonged, to Spain. Thus the vara at Havannah is 0·927 of an English yard; in Chili 108 varas make 100 imperial yards; and the Mexican vara is 3 geometrical feet.

**VARA'NUS.** See MONITOR.

**VAREC**, the name applied in Normandy and the Channel Islands to the ash of seaweed. See KILL.

**VAR'GAS, LUIS DE** (1502–68), a pupil of Barrera, in Italy, deserves mention as being the first Spaniard to introduce and teach in his own country the true method of oil painting and fresco. He passed not less than twenty-eight years in Italy, with visits to Spain, dying at last at Seville, his native place. His best pieces were always sent to Spain, and the "Temporal Generation of Christ" in the cathedral of Seville is a really meritorious work. He painted brilliantly and with expression, but his work was wanting in harmony.

**VARIABLE STARS.** See the article STAR (fifth paragraph).

**VARIATION OF THE COMPASS.** See DECLINATION OF THE MAGNETIC NEEDLE.

**VARIATION OF THE MOON**, one of the lunar inequalities, first discovered by Tycho Brahe, and arising from the varying power of the sun's pull on the moon in different points of her course. Its maximum value is 32 minutes.

When the moon is at full the sun's gravitation-force upon her is least, and as the earth is both larger and at this time nearer to him, the tendency will be to pull the earth away from the moon—i.e. to counteract the earth's pull upon the moon. Also when the moon is at new, she being nearer to the sun than the earth, is to a certain extent pulled away from it. At the quadratures, on the other hand, the sun's action on the moon assists the earth's action on the moon. Consequently there should be acceleration of the moon's pace in passing from syzygy (new or full) to quadrature, and retardation in passing from quadrature to syzygy.

But there is another solar effect upon the moon to be considered, as well as that which assists or defeats the earth's pull—namely, the sun's pull upon the moon herself, regarded as assisting or retarding her motion. Resolving this pull by the composition of forces we isolate the tangential effects, and we find them precisely opposite to the radial effects above described. Now since the tangential effect is greater than the radial, and since the moon's actual pace is the result of a continual conflict between the two, it results that, contrary to what would at first appear, the moon moves fastest in syzygy, and slowest when nearly in quadrature.

**VARIATIONS**, in mathematics. See COMBINATIONS.

**VARIATIONS**, in music (anciently called *Doublies*), are those modifications of a given melody which shall present it under every variety of treatment, as the basis of a series of figures in arpeggios or fragments of scales, as a treble, a bass, or a tenor, as the subject of a fughetto, in intricate harmony, in massive chords, in syncope treatment, in the major or minor mode, &c. The only limit to the fancy of the composer is that the subject must be clearly traceable throughout. It is usual to close with a very elaborate variation, terminated by a brilliant coda. The finest works of the kind are Beethoven's thirty-two variations and Mendelssohn's seventeen variations, both of them compositions of the highest merit and originality. The form of air and variation is now somewhat hackneyed and out of fashion; it is one easily abused by mechanical writers.

**VARICEL'LA.** See CHICKEN-POX.

**VARICOCELE**, sometimes known as *Circoccele*, in surgery, is the name given to a dilated, elongated, and tortuous condition of the veins of the spermatic cord, due

either to increased pressure within the veins, or to diminished resistance in the walls of the vessels and the surrounding structures. The affection is generally painless, but it is sometimes attended by an inconvenient relaxation of the scrotum, and in some cases a feeling of weight and uneasiness is experienced after standing or prolonged exercise. It is a very common affection, and in slight cases no treatment is required. Where the varicocele is large a well-fitting suspensory bandage may be worn with advantage, and cold bathing, the avoidance of constipation, and the use of tonic medicines are called for. Should the enlarged veins become inflamed rest in a recumbent attitude, with fomentations and leeches, is the treatment indicated. In very severe cases the surgical operation of excision of the veins may be required.

**VARICOSE VEINS** are veins in a state of permanent and unnatural dilation. The cause of the disease is to be looked for in some obstruction to the return of the blood through the affected veins. In some cases the obstruction may be in the heart itself, and old cases of heart disease, when the right side of the heart becomes involved, are apt to be attended with a varicose condition of the veins of the neck. The pressure of tumours, aneurisms, &c., upon a large venous trunk causes a varicose condition of its superficial branches; the pressure of the enlarged uterus in pregnancy is a fertile source of varicose veins in the legs; and the pressure caused by constipation upon the rectum gives rise to the varicose veins known as *Hæmorrhoids* or piles. For varicose veins of the spermatic cord see under *VARICOCELE*. A varicose condition of the veins of the legs arising from the pressure of tight garters, from occupations such as serving behind a counter or washing, involving much standing as well as leaning forward, from excessive walking, from repeated pregnancies, and sometimes from weakness of the coats of the veins themselves, is an exceedingly common complaint. In the natural condition, by the frequently recurring contraction and relaxation of the voluntary muscles, the veins of the lower extremities are alternately filled and emptied. Walking about or any ordinary form of exercise therefore facilitates the movement of the blood in the veins. But where a single set of muscles only are kept in constant and unvarying action, as in continued standing at a desk or machine, the movement of the blood is obstructed instead of being aided by the muscular contraction, and it accordingly accumulates in the veins near the point of obstruction, especially in the lower extremities, where it has to mount upward against the force of gravity. The veins are thus unnaturally distended, and when their distension becomes so great that the edges of their opposite valves are drawn away from each other, the weight of the superincumbent column of blood is thrown upon that portion of the vein next below, and thus the affection extends, gradually involving successive portions of the venous system. The veins are sometimes unequally dilated with knots and protuberances distributed along their course, and they are lengthened as well as dilated, their course becoming more tortuous. Sometimes the coats of the veins are thicker, sometimes thinner than natural, or both states may be present in the same vein. The premonitory symptoms of varicose veins are generally numbness, cramps, a feeling of heaviness in the limbs, slight swelling of the ankles and feet, followed by the appearance of a bluish and swollen vein about the calf or ankle, which swelling becomes permanent and extends its influence. The presence of varicose veins is apt to cause more or less swelling of the affected limb with a feeling of weight and fullness; sometimes they give rise to or are accompanied by ulcerations, which are difficult to heal; occasionally, from gradual thinning of their coats or from accident, they burst and give rise to copious hæmorrhage (the vein, owing to the obliteration of its valves, bleeding from each extremity of

the wound), which may prove fatal. When varicose veins first appear treatment consists in the removal of the exciting cause, in attention to the general health, in rest and support for the affected limb, and in the use of a firm bandage. During sleep the limb should be raised slightly above the level of the body. In cases where varicose veins have become established the annoyance and suffering attending them may be very much alleviated by the application of a firm roller bandage, or, better still, an elastic stocking, to the affected limb, thus affording equable support to the distended veins. An essential condition, also, is that the patient should avoid a continued standing posture as much as possible, and should rest the limb whenever practicable in a horizontal position. Where a varicose vein bursts the patient should immediately lie down and lift the affected limb as high as possible, supporting it against the wall, the back or arm of a chair, &c., and a pad should be applied over the wound and secured by means of a tight bandage. These measures are generally sufficient to restrain the flow of blood until surgical assistance can be secured. In extreme cases of varicose veins it may be necessary to resort to surgical operations in order to secure their obliteration. Four or five different methods are in use, but they are not always successful, the neighbouring veins often becoming varicose in the place of that which has been obliterated, and they are not unattended with danger.

**VARIETY.** See *SPECIES*.

**VARINÁS** or **BARINÁS**, the chief town of the province of Barinas, in the republic of Venezuela, lies near 7° 30' N. lat. and 70° 12' W. lon., at the base of the Nevado de Mérida, an offshoot of the Andes, and on the north-western edge of the great plain of the basin of the Orinoco, 90 miles south of Trujillo. The inhabitants of the mountains bring to this place their corn and fruit, and take in exchange the produce of the numerous herds of cattle which pasture on the plains. The country which surrounds the town is very fertile, and especially fit for the cultivation of tobacco, which forms the staple article of its commerce, and is sent to Europe by way of Angostura. The river St. Domingo, an affluent of the Apure, which rises on the declivities of the Nevado de Mérida, and passes through Barinas, becomes navigable at Tortuno about 11 miles below, so that the latter may be considered as the port of Barinas, from which its exports are sent down the St. Domingo, the Apure, and the Orinoco to Angostura. The population is about 4000.

**VARIO'RUN** editions of the Greek and Roman classics (*Editiones cum notis Variorum*) are those in which the notes of numerous commentators are inserted. Such editions were published chiefly in Holland in the seventeenth and eighteenth centuries.

**VARLEY, JOHN**, a celebrated water colour painter, was born in London about 1777. He received little direct instruction in art, his most useful lessons seemingly being acquired in the course of a sketching tour made in North Wales in 1799, in company with Arnold the landscape painter, and his best early practice in making coloured drawings of Surrey scenery for Dr. Munro, the friendly patron of Girtin and Turner. Varley made his reputation slowly, but in good time he came to be regarded as one of our best water-colourists. His later pictures were generally compositions—attempts to embody in a conventional form the grander and more poetical aspects of nature. His mind was of a very peculiar turn, and one of his fancies was a firm belief in astrology. He was sadly deficient in prudential habits, and despite the income derived from the sale of his pictures, and a considerable practice in teaching, he lived and died in embarrassed circumstances. He died 17th November, 1842.

**VAR'NA**, a strongly fortified seaport of Bulgaria, is situated on the north-west extremity of a fine bay in the



Black Sea, 47 miles east of Shumla, and 180 miles N.N.W. of Constantinople. It is surrounded by a stone wall, 10 feet high, which is loopholed and defended by several forts and other outworks. The bay is formed by two rocky promontories, and though open to the east and south-east it affords good anchorage, being sheltered on the north and north-east, from which blow the most dangerous winds of the Black Sea. At its southern entrance is a lighthouse 164 feet high. The streets of Varna are crooked and irregular. The only public edifices of any note are a few mosques with tall minarets. The houses, which are mostly of wood, are of different colours, with red tiled roofs. Lake Denna (12 miles long and from 1 to 3 miles wide) lies to the west, and extends through the marsh land towards Shumla. By means of a navigable cut to the bay and other improvements this lake might be made one of the best harbours in the Black Sea. Varna has regular steam communication with Constantinople, Kustendje, and the ports on the Black Sea and the Danube, and a railway, 120 miles long, connects it with Rustchuk. The population in 1881 was 24,600. The Hungarian army of Ladislas and John Hunyades was totally defeated near Varna by the Turks under Amurath II., 10th November, 1444. It was taken by the Russians in 1828. A great fire, supposed to have been the work of an incendiary, on 10th August, 1854, destroyed about one-fourth of the houses and vast quantities of military stores prepared for the expedition to the Crimea, the allied French and British troops having been encamped here for some time in that year. Varna remained unmolested in the war between Russia and Turkey in 1877-78, but at the congress of Berlin it was included in Bulgaria.

**VARNHAGEN VON ENSE, KARL AUGUST**, an eminent German prose writer, was born at Dusseldorf, 21st January, 1785. He studied medicine at Berlin, but devoted the greater part of his time and energy to philosophy and literature. In 1809 he entered the Austrian army, where he obtained a lieutenancy. He was wounded at the battle of Wagram, a battle of which he subsequently published an admirable description. After his recovery he accompanied Prince Bentheim as aid-de-camp on a mission to Paris, and soon after was admitted to the acquaintance of the Prussian minister, Von Stein, then residing at Prague. On the recommencement of war in 1813, he joined the Prussian army as aid-de-camp to General Tettenborn. In 1814 he obtained an appointment in the Prussian diplomatic service, and accompanied Prince Hardenberg to the Vienna Congress. After the restoration of peace, he became resident minister at Carlsruhe, but he resigned some years after. From the year 1819 till the day of his death he resided at Berlin in literary retirement. He died 10th October, 1858. Varnhagen began his literary career with writing poetry, but by the march of events was led to political memoirs, to contemporary history, and biography. His posthumous "Diaries," which were published by his niece, Ludmilla Assing, from his manuscript "Pandora-box of Scandal," as a contemporary periodical has termed it, are vastly superior to the more formal "Memoirs," and form, indeed, an inestimable contribution to modern history, however indiscreet their publication itself may be deemed.

It is also necessary to mention Varnhagen's highly accomplished wife, the celebrated Rahel, who was born of Jewish parents at Berlin in 1771, and died 7th March, 1833. This fascinating and highly intellectual woman, who talked eloquently on the deepest questions in the German philosophy, was respected and courted by the most eminent men of her time, and after embracing Christianity, was married in 1814 to Varnhagen, who was her junior by fourteen years. After her death, her husband published "*Rahel, ein Buch des Andenkens für ihre Freunde*," two volumes; and "*Galerie von Bildnissen aus Rahel's Umgang*," two vols.

**VAR'NISH**, a solution of resinous matter used for covering the surfaces of bodies to give them a shining appearance, and to protect them against the air and moisture. The principal substances which enter into the composition of varnishes are: as solid constituents, resin, amber, mastic, sandarac, lac, elemi, dammar, benzoin, copal, asphalt, and caoutchouc; as solvents, oil of turpentine, linseed, poppy, and a few other vegetable oils, wood naphtha, benzine, and some other constituents of petroleum, alcohol, and ether; as colouring materials, gamboge, dragon's blood, aloes, saffron, annatto, and turmeric are used—to which may be added small quantities of cochineal. French yellow, and other colours, to impart increased brilliancy. Varnishes may be divided into four classes: (1) ether varnishes; (2) spirit varnishes; (3) volatile-oil varnishes; and (4) fixed-oil varnishes. Of the first kind the only one much used is that for repairing the glazing of the coloured enamels used in jewelry. It is made by gradually adding five parts of pulverized copal to two parts of sulphuric ether, in a flask which is corked and occasionally shaken for twenty-four hours or longer. Spirit varnishes made with alcohol are conveniently prepared, and, on account of their rapid drying and leaving no disagreeable smell, are in frequent use in the household for covering various articles of art or *vertu* made by amateurs. When large quantities of spirit varnish are made, a still, with a capital and worm, is usually employed. Spirit varnishes are liable to scale off or crack, and are incapable of resisting friction or blows. To diminish this tendency, small quantities of oil of turpentine are often added to them, or some of the softer and more adhesive resins are employed in their composition. The alcohol should not be of less strength than 10 to 36 degrees Baumé (specific gravity 0.830 to 0.849), or otherwise the resins dissolve with much more difficulty, and the varnish will neither be so brilliant nor so drying. Three ways of making the solution are employed, viz. (1) by simply digesting the resins, &c., in the proper quantity of alcohol, either in the shade or exposed to the sun, occasionally shaking the bottle; this takes a long time, and many substances cannot be dissolved in this way, but the product has the least possible amount of colour; (2) by heating over a water bath, which is much more rapid, but produces more highly coloured varnishes; (3) by heating over an open fire, which still more changes the colour of the resins, and consequently of the varnish, but it is so much more rapid that it is employed almost exclusively for manufacturing purposes.

Oil of turpentine is almost the only volatile oil employed in varnishes, and the most important one into which it enters is copal varnish. The ingredients and modes of preparation are nearly the same as for spirit varnishes. An important difference between the two kinds is, that spirit varnishes are injured in quality by keeping, while those with oil of turpentine are very much improved by it, from the more intimate union which takes place between the resins and the oil.

Fixed-oil varnishes are almost entirely made with linseed oil, for which poppy oil is sometimes substituted, and they generally contain also a large proportion of oil of turpentine. The resins used are almost exclusively the different kinds of copal and amber. In consequence of the slow evaporation of the solvent, and the large amount of residue from it, they are, of all varnishes, the slowest in drying, but the most durable. For articles of sheet iron, tin, copper, or brass, and for all articles exposed to constant wear and frequent rubbing, they are particularly adapted. In consequence of the difficult fusibility of the copal, a very different process from that used for spirit and turpentine varnishes must be employed in their preparation. The resin is first melted over an open fire; and when perfectly liquid, the linseed oil, heated to 300° or

400° Fahr., is incorporated with it, and finally the oil of turpentine. It is indeed possible to melt copal directly in boiling oil, and the subsequent addition of a proper quantity of oil of turpentine will bring it to a suitable consistency; but as in this case the oil is always more or less burnt, the varnish is both more highly coloured and less drying, and this method has been generally abandoned. Great care should be taken that the resins used are of equal fusibility, for if the heat is much raised or long continued after complete fusion of a part, there will be much more colour than even if the more infusible parts alone were used.

Besides the four classes of varnishes above described, others are employed for special purposes which can scarcely be included under any of them. Among these is an India-rubber varnish, which appears to possess some valuable properties. The India-rubber is cut into small pieces and digested in carbon di-sulphide, which forms a jelly with it; and by treating this with benzole, a large proportion will be dissolved. The liquid must be strained through a woollen cloth, and the carbon di-sulphide removed by evaporation in a water bath, after which the liquid may be diluted with an additional quantity of benzole. A gutta-percha varnish is made by dissolving one part of gutta-percha in four or six parts of oil of turpentine, and adding eight or ten parts of linseed oil varnish boiling hot. It is well adapted for varnishing maps and prints, as it does not affect the whiteness of the paper, does not reflect light disagreeably as resinous varnishes do, and is not liable to scale off. Another valuable varnish, called "milk of wax," is prepared by melting a certain quantity of white wax, adding to it while in fusion an equal quantity of alcohol, of specific gravity 0.83, stirring the mixture, and pouring it out upon a porphyry slab, on which it is ground with a muller until it becomes smooth and homogeneous, when water is mixed in by degrees to the amount of four times the weight of the wax, and the emulsion finally strained through canvas. This may be spread with a smooth brush on the surface of a fresco painting, allowed to dry, then fused by passing a hot iron over it, and when cold rubbed with a linen cloth to bring out the lustre. To some such process as this the ancient paintings on the walls of Herculaneum and Pompeii owe their freshness at the present day.

The following comprise some of the best recipes for varnishes:—

Ingredients.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Shellac, . . . . lbs.,						2	2					1	1	1
Mastic, . . . . "						1								
Sandarac, . . . . "					2	4								
Dammar, . . . . "										4				
Resin, . . . . "								4						
Amber, . . . . "									6					
Benzoin, . . . . "														
Copal, . . . . "														
Spirits of wine, galls,	8	7	8	8								1	1	
Oil of turpentine "						1	5	1						
Linseed oil, . . . . "	3	3	3	5				1	1	4	1			1
Turpentine, . . . . lbs.,	2	1	2	2						2				
Turpentine varnish, pt.								1						
Venice turpentine, oz.,						18	18							
Canada balsam, galls,														
Powdered glass, lbs,							4							
Black sealing wax, "													3	
Red sealing wax, "												2		
Asphalt, . . . . "														3

No. 1 is copal varnish for fine paintings; 2, jappanners copal varnish; 3, best body copal varnish, for bodies of carles, &c., which require polishing; 4, carriage varnish for parts not requiring to be polished; 5, best white hard spirit varnish; 6, white spirit varnish for violins; 7, brown hard spirit varnish; 8, turpentine varnish; 9, crystal varnish; 10, amber varnish; 11, paper varnish; 12, sealing wax varnish; 13 and 14, black varnishes. Besides

all these compound varnishes, the liquid resins which exude from many species of trees, especially in China, Japan, Burma, and India, are used as varnishes, either crude or with slight preparation.

**VARNISH TREE** is a name given to several trees of the order ANACARDIACEÆ, the resinous juice of which is used for varnishing or lacquering. One of the best known is the Japan Varnish Tree (*Rhus Vernix*). The juice, which exudes from incisions made in the tree, is at first milky-white, but becomes black on exposure to the air. The black varnish tree of Burma and Martaban is *Melanorrhœa usitatissima*. Short joints of bamboo, closed at one end, are thrust into holes made in the trunk of this tree; at the end of about two days they become full of a whitish thick juice, which turns black on exposure to the air. A similar varnish is yielded in India by the fruit of *Holigarna longifolia*, a tree of the same order.

**VAROLI, CONSTANZO**, a physician, surgeon, and anatomist, was born at Bologna in 1542. In 1572 Gregory XIII. appointed him his first physician and professor in the College of Sapienza. He lectured at Rome, and acquired a considerable reputation as an anatomist and as a surgical operator, particularly for his success in lithotomy. He died in 1575 at the age of thirty-two. A portion of the brain, first well described by him, the Pons Varolii, perpetuates his name.

**VARRO, MARCUS TERENTIUS**, was born at Rome B.C. 116, and descended from an ancient senatorial family. He was instructed by L. Ælius, who is spoken of as a most distinguished person, and afterwards by Antiochus, an academic philosopher. In B.C. 67 he was at the head of a division of the fleet of Pompey the Great in his war against the pirates. During the civil war between Cæsar and Pompey he held the western part of Spain for the latter. When his colleagues had been compelled to surrender he also surrendered in the neighbourhood of Corduba, and after being set at liberty he repaired to Pompey at Dyrrachium, where he was staying at the time of the battle of Pharsalus. During the absence of Cæsar in Egypt, B.C. 47, Mark Antony destroyed Varro's villa near Casinum, together with a great part of his property. After the defeat of Pompey Varro withdrew from public life; and when Cæsar came to Rome was reconciled to the dictator, who intrusted him with the purchase of the books for and the whole management of the Greek and Latin libraries which were then established at Rome. Cæsar was murdered in B.C. 44, and Varro, then a man of upwards of seventy years of age, was placed by Mark Antony on the list of the enemies whom he proscribed. His friends concealed and protected him until the danger had passed over, but his libraries were irrecoverably lost. After the battle of Actium, B.C. 30, he again lived at Rome, and appears to have been esteemed by Augustus, who gave him the superintendence of the library founded by Asinius Pollio. In his eighty-eighth year he was still engaged in authorship (Pliny, "Hist. Nat." xxix. 18). He died in the ninetieth (B.C. 27), or, according to Valerius Maximus, in the hundredth year of his age.

Varro was the most erudite of the Romans, and one of the most learned men that have ever lived. With all the literature of his time he was thoroughly familiar. His works were very numerous. Of his "De Lingua Latina," originally in twenty-four books, only six remain, and these are in a mutilated state. It was dedicated to M. Tullius Cicero. If not very valuable as a treatise on the Latin language, it is useful for the remarks which are interspersed. The best edition is by C. O. Müller (Leipzig, 1833, 8vo). The Bipont edition (1788, two vols., 8vo) contains also a collection of the fragments of Varro's lost works. The most important of these forty-one books of antiquities is so largely quoted by St. Augustine as to be quite preserved in outline.

The "De Re Rustica," in three books, is complete, and the text in a better state than that of the treatise "De Lingua Latina." Though written when Varro was eighty years of age, its style is pleasing and lively. Besides being our best authority on ancient agriculture, it contains much curious matter on other subjects. It is printed in the collection of the "Scriptores Rei Rusticæ," by J. M. Gessner, and in that of J. G. Schneider.

**VAR'RO, PUBLIUS TERENTIUS ATACINUS**, was born near Narbonne in Gaul 82 B.C. He was distinguished as a writer, his most celebrated work being an epic poem on the Argonautic expedition. In this he borrowed largely from Apollonius Rhodius, and Virgil is said to have borrowed in his turn from Varro. His poems, now lost, are highly praised by Ovid, Propertius, and Statius.

**VARUNA** (Sansk. *varī*, to surround), son of Aditi, the god of space, is the sky-god, the "surrounder," in the Hindu Vedic mythology. Varuna is the deity of the sun from sunset to sunrise, as Mitra is of the sun during daylight. The name *Varuna* is evidently only the Sanskrit form of the Greek *Oureanos*, and the two deities are as similar in essence as are their names. As Varuna guards the sun's path at night he must be waking then, and the stars are his countless eyes. He is therefore regarded as the all-seeing one or providence. Further, as rain or dew falls so often at night, Varuna is the god of rain, of rivers, and the sea. The following verses are from a hymn to Varuna in the Rig Veda:—

"Let me not yet, Varuna, enter into the house of clay: have mercy, Almighty, have mercy!"

"If I go trembling like a wind-driven cloud: have mercy, Almighty, have mercy!"

"Thirst came upon the worshipper, though waters lay all round about him: have mercy, Almighty, have mercy!"

"When we ignorantly break thy law, Varuna: have mercy, Almighty, have mercy!"

**VARUS, PUBLIUS QUINTILIUS**, is known to fame as one of the most unfortunate generals in history. He had been consul B.C. 13, and afterwards governor of Syria, and had earned much trust, so that the Emperor Augustus sent him in B.C. 7 to the post of danger in the empire, the German frontier. The Romanized part of Germany, recently conquered by Drusus, he was ordered to regularize into the settled administration of a Roman province. His attempt to do this, without due tact and statesmanship, roused the untamed chiefs to fury, and headed by the Cherusci, under their leader, whom the Latins called Arminius (no doubt "Hermann"), they fell suddenly on Varus like a bolt out of a clear sky. He had three legions with him (25,000 to 30,000 men), and quickly entrenched himself. Hermann knew how to draw him beyond his entrenchments with false intelligence, and let him get entangled in the Teutoburg mountain passes with his long line of march, his waggons and camp-followers, women and children. Even thus Varus resisted bravely when attacked, and struggled on to a comparatively clear space, where he rallied. For two days more the Romans desperately fought their way through the passes foot by foot, and, sadly diminished in number, they had almost won their way to Aliso, on the Lippe, their last hope, when they were met by the full force of the Germans and completely broken. Varus fell on his sword in despair (9 A.D.). Augustus burst into a storm of weeping at the news, crying, "Varus, Varus, give me back my legions!" and the frontier of Rome rolled back from the Weser to the Rhine.

**VASARI, GIORGIO**, born at Arezzo in 1512, was a painter and architect, but his reputation now rests nearly exclusively upon his "Vite de' più eccellenti Pittori, Scultori, e Architetti," first published in Florence in 1550, in two vols. 8vo. Many editions of the work have been since published, and an English translation is included in Bohn's

Library. Vasari is often accused by other Italians of inordinately favouring Tuscans and Florentines; but it is only natural to remember that he had much better and fuller information on these than on other schools. As a grave authority on details Vasari is often impugned, but in the main he is most correct. His sketches are brilliant, and indeed his work is imperishable, full of charm and interest.

The last life in Vasari's work is his own, which he traces up to his fifty-fifth year. He was instructed in design by his father Antonio, and in painting by several masters, including Michelangelo, at Arezzo, Florence, and Pisa. He entered the service of Cardinal Ippolito de' Medici, who took him to Rome, and introduced him to Clement VII. Afterwards he returned to Florence, where he met with all the success he could desire; but his paintings are not remarkable for any particular excellence. He died at Florence in 1574.

**VAS'CULOSE**, a variety of cellulose forming the fabric of the vessels of wood. It is distinguished from cellulose by its insolubility in oil of vitriol and in ammonium cuprate.

**VAS'ELINE** or **PETROLEUM JELLY**. This substance is much employed in medicine under a variety of names, as adepsine, chrisma, cosmoline, fosiline, and ozokerine. It is a petroleum product of semi-solid, unctuous consistence, and a pale opal yellow colour. It is a deposit from the American petroleum, and is found in the oil tanks where it has been stored. It is purified by filtration through animal charcoal, and can be obtained quite colourless. It melts about 95° Fahr. It is inodorous and tasteless, and does not irritate the skin, nor mucous membranes, nor wounds. It is much employed in ointments instead of lard, over which has the great advantage of being unchangeable, and therefore free from oxidation or rancidity.

It cannot be saponified, and caustic alkalis have no action on it; but it is easily removed from the skin by soap and water. It combines with all oils and fats, and it possesses considerable solvent power for thymol, menthol, and salicylic and carbolic acids; also for morphine, veratrine, and other alkaloids, which can thus be efficiently applied to the skin. Used alone it is an excellent lubricant for the skin, and protects it from exposure, preventing drying, scaling, and cracking. It is therefore very useful in the eruptions of scarlet fever and measles, also in burns and scalds. A mixture with eucalyptus oil, applied on cotton wool, is much used for the latter. Vaseline is a hydrocarbon.

**VASES** (Lat. *vas*; Ger. *flas*). This word in its widest sense comprises all vessels intended to contain fluids, whether they are made of metal, stone, or clay; but we treat here of those which have come down to us from remote antiquity, and are remarkable for their qualities as works of art, both in form and in decoration. The most numerous class are those painted and unpainted vases of dried or baked clay, which have of late years been discovered by thousands in Etruria, Southern Italy, Sicily, Greece, and some of the Grecian islands. Such vases are frequently found in tombs, catacombs, and other depositories of the dead. The period during which the art of vase-painting completed its development from the rudest elements to the highest perfection is comprised in the three centuries before the Christian era, from B.C. 500 to about 200.

Various attempts have been made to classify the immense number of ancient painted vases, of which specimens are preserved in all the museums of Europe. The most convenient criterion for such classification is their style of painting, which alone affords a very obvious distinction, and also marks the different stages of the art, though the rule is not infallible, as it is probable that in

some cases a very ancient style was imitated at a later period. With this caution we may divide all Greek and Italian painted vases into four great classes:—

1. Vases with paintings in the *Egyptian style*.—This name is not meant to imply that they were made in Egypt or by Egyptians, but merely that their style of painting resembles that on the monuments of Egypt. The characteristics by which vases of this class are easily distinguished are as follows:—The vases are of a pale yellow colour, on which the figures, generally of animals or flowers, are painted in a black or brown colour, sometimes with the addition of purple or white tints. Grace is entirely wanting. Some critics have imagined that several of the vases of this class may be as old as the time of Homer, but the best antiquaries are agreed that most of them are not older than the year B.C. 500. They occur most frequently in the tombs of the Volsci in Etruria, and in those of Nola.

2. Vases with paintings in the *archaic or ancient style*.—These have black figures on a red ground, and the figures are no longer mere animals and ornaments of the vessels, but contain scenes taken from the stories about the gods and heroes of Greece and from the occurrences of ordinary life. The form, which is usually that of the amphora, has a freedom and elegance of proportions which are wanting in those of the first class; and they vary greatly in size. The peculiarities of the designs are strong outlines of the main parts of the human body, and the expression of the highest degree of physical strength. In the representation of animals, especially horses, there is sometimes a considerable degree of boldness and beauty. The majority of vases of this class are generally believed to have been made previous to the year B.C. 430.

3. Vases with paintings in the *severe style*.—In these vases the figures are red, the natural colour of the clay, on a beautiful black ground. The most striking features in the designs are a certain moderation and harmony. The drapery forms varied and rich folds, though they show a conventional regularity. The heads are worked with great care, and sometimes are truly graceful; the hands and feet are better drawn than on the vases of the former classes. The subjects represented are the same as those on the vases of the second class, but repose is more frequent than action. The forms are elegant, and they present greater variations both in shape and size. They occur most frequently in Etruria and at Nola. This class is commonly assigned to the period from B.C. 460 to 420.

4. Vases with paintings in the *beautiful style*.—In the vases which are regarded as the true representatives of this period all harshness and severity of style have disappeared; liveliness in the composition, perfect freedom in action and movement, as well as in the drapery, are the essential characteristics. The colour of the figures, as in the third class, is the natural red of the clay, and white is used to represent a variety of things, such as ribbons, garlands, the flames of torches, and the like. The inscriptions, too, are usually painted in white. Vases of this class are not often found in Etruria; they are most frequent in Nola, Sicily, and Attica. Those which exhibit the very highest perfection of the art appear to belong to the period beginning with the year B.C. 400.

**VASO-MOTOR NERVES** are those which regulate the tone or degree of elasticity of the arteries, thus controlling the supply of blood to the part. If the muscular coats of the arteries of a part are strongly stimulated they contract, and little blood passes; but if the nerve be divided they relax and dilate, and the part is quickly congested with blood. Thus the temporary paralysis due to shock, if at all intense, permits the cheeks and neck to be suffused with blood, which we call blushing.

Experiment shows that the fibres producing this vaso-motor action all primarily come from the gray matter of a certain part of the medulla oblongata or uppermost portion

of the spinal cord, where it joins the brain. This is called the vaso-motor centre, and by it the tone of all the blood-vessels is regulated. There are also some secondary or subordinate centres in the spinal cord itself. Passing down the interior of the spinal cord from the centre is the medulla, the vaso-motor fibres issue here and there with the anterior roots of the spinal nerves, traverse the various ganglia on the pre-vertebral cord of the sympathetic system, and accompanied by sympathetic branches from these ganglia pass to their destination. The nerve impulses which issue from the vaso-motor nerve centre are for the most part due to reflex action, but direct brain action is also occasionally their cause, as in the example of blushing given above. There seems reason to divide the vaso-motor fibres into two classes, one of constrictors and one of dilators.

**VATICAN PALACE**, the largest palace in the world, is situated at Rome, on the right bank of the Tiber. It was originally a dwelling house of the popes, near the anterior court of the old Church of St. Peter. [See *PETER'S CHURCH*, St.]

In the year 1116 Eugenius III. began building a palace, which grew by degrees into an immense mass of buildings, known by the general name of the Vatican. Gregory XI., on his return from Avignon, fixed his permanent residence here on account of the protection afforded by the neighbouring Castle of St. Angelo. It continued to be the residence of the popes until about the middle of the sixteenth century, when Paul III. built the palace on the Quirinal Mount, which is now the residence of the King of Italy. The Pope has permanently resided at the Vatican since 1870.

The assemblage of buildings called by the name of the Vatican, and which extends in an oblong irregular mass north of the church as far as the town walls, consists mainly of—(1) the Papal Palace, (2) the court and garden of Belvidere, (3) the Library, (4) the Museum. The total number of apartments is computed at 4122. The Papal Palace contains, among other remarkable objects, the Sistine Chapel and Pauline Chapel, both painted by Michelangelo. The Sistine Chapel contains the painting of the "Last Judgment;" the four "stanzas," or apartments, painted by Raffaele; and the "loggia," or open galleries, painted by Raffaele's pupils, under his direction. A corridor, about 1000 feet long, joins the Papal Palace to the building called Belvidere, which serves as a museum, and which contains two of the finest pieces of sculpture in the world—the *ARROLO BELVIDERE* and the *LAOCOON*. About half-way up this corridor is the entrance to the Vatican Library, which was built by the architect Fontana, under Sixtus V. It is the richest in Europe in MSS. The museum, or collection of works of art, mostly of ancient sculpture, founded by Pius VI., is likewise the richest of its kind in Europe.

**VATTEL, EMMERICH**, a celebrated writer on the subject of international law, was born at Courret, in the principality of Neuchâtel, in 1714. He was sent to the University of Basel to study the classics and philosophy; and finally he repaired to Geneva to study theology. But the writings of Leibnitz and Wolff had more attractions for him than the "Institutes" of Calvin. In 1741 he proceeded to Berlin, in the hope that the court of Frederick II., who had recently ascended the throne of Prussia, and whose taste for literature was general, might afford a field for his talents. In 1712 he published a defence of Leibnitz's system, which he dedicated to Frederick. His wish was to enter the diplomatic service of Prussia, but no vacancies occurred, and in 1744–45 he entered the service of the King of Poland and Elector of Saxony. In 1746 he was sent to Bern as the Polish ambassador to that republic. His duties were small, and he had leisure for literary pursuits, and to labour on the work by which his name is now chiefly known, his "*Droit des Gens*," or "*Law of Nations*."

The first edition of this work was published at Neuchâtel in 1758, but the title-page bears the fictitious place of publication, "Londres." About this time he was recalled to Dresden and made a privy councillor. He died 28th December, 1767.

His "*Droit des Gens*" shows no very great acquaintance with treaties, or even with political history. His principal authorities are Grotius, Puffendorf, and Wolff. It has had a great reputation, and has passed through many editions. Its merits, such as they are, consist in its arrangement, and its being written in an easy style. The matter is rather vague, and it would require a very skilful hand to put it into the best practical shape. There is an English edition of Vattel, which Mr. Chitty republished with notes in 1833.

**VAUBAN, SÉBASTIEN LE PRESTRE DE**, Marshal of France, one of the most illustrious of military engineers, was born on 1st May, 1663, at St. Leger de Fougères, near Saulieu, in Burgundy. He came of a noble but impoverished family, and being left an orphan at an early age he was educated by the curé of his village, who imparted to him the only instruction in trigonometry and mensuration that he ever received. At the age of seventeen he entered the regiment of Condé, which was then in the service of Spain, and he had already gained considerable distinction by his gallantry and abilities when, in 1653, he was taken prisoner by the French, and induced by Cardinal Mazarin to enter the royal service, being made a lieutenant in the regiment of Burgundy. In 1655 he received a commission in the corps of engineers, and having now found his true sphere of activity, his influence and fame rapidly increased. During the war against the Spanish power in Flanders he directed numerous sieges under Turenne, including those of Landrecies, Condé, St. Guislain, Valenciennes, and Montmédi, and in the year 1658 he had the chief direction of the attacks upon Gravelines, Ypres, and Oudenarde. On the conclusion of peace in 1659 he was employed in improving and constructing fortresses, in which he displayed remarkable skill and originality. In 1667, when the war recommenced, Vauban had the direction of those sieges which the king conducted in person, and his services gained him both praise and preferment. It is impossible to follow him through all his labours as a military engineer in war and peace, but it has been calculated that during his military career he conducted 53 sieges, took part in 140 battles, built 33 new fortresses, and improved 300 old ones. He was the first to introduce to Western Europe the method of approach by parallels (first used by the Turks), at the siege of Maestricht in 1673, and he invented and used the system of ricochet firing at the siege of Ath in 1697. In conducting his war-like affairs he was uniformly humane, and he always strove from principle to avoid all useless expenditure of human life. As a civil engineer he constructed the aqueduct of Maintenon, the mole at Honfleur, and several canals in the north and east of France, besides laying out and improving many seaports. In 1699 he was elected an honorary member of the Academy of Sciences, and in 1703 he was made marshal of France. He died at Paris on 30th March, 1707. Vauban wrote largely on a variety of subjects, and devoted during the latter portion of his life much attention to political economy, but he published only his "*Projet d'une Dime Royale*," a scheme for the collection from all classes, according to their means, of a single tax in lieu of all others, which brought upon him the displeasure of the king, and which was suppressed by order of the royal council. His principal military writings, edited by General de la Tour Foixac (three vols., Paris, 1796), comprise his celebrated "*Traité de l'Attaque et de la Défense des Places*" and "*Traité des Mines*," originally published at the Hague in 1737, and frequently reprinted. See G. Michel's "*Histoire de Vauban*" (Paris, 1879).

**VAUCLUSE**, a department in the south-east of France, formed out of the counties of Avignon and Venaissin, the principality of Orange, the district of Apt, and the valley of the Sault, all formerly belonging to Provence, takes its name from the fountain of Vaucluse, celebrated in the writings of Petrarch. It is bounded N. by the department of Drôme, E. by Basses-Alpes, S. by the Durance, which divides it from Bouches-du-Rhône, and W. by the Rhone, which separates it from Gard and Ardèche. Its greatest length from north-west to south-east is 69 miles, its greatest breadth is 38 miles. The area is 1370 square miles, and the population in 1886 was 211,787.

*Physical Aspect.*—The surface is mountainous, the eastern and southern districts being covered with sub-alpine ridges, which extend from the departments of Basses-Alpes and Drôme. Mont Ventoux, the highest point, is 6600 feet above the level of the sea. Along the left bank of the Rhone, however, and the right bank of the Durance in its lower course, there is a considerable extent of level country, forming the plain of Orange in the north, that of Avignon in the centre, and Cavaillon in the south.

*Hydrography.*—The department is drained by the RHONE, the DURANCE, and their feeders. Among the tributaries of the former are the Lez, the Aigues, and the Sorgues (with its affluent the Nesque, the Auzon, and the Ouvèze). The Calavon and the Lèze are feeders of the Durance. There are a great number of canals for the purpose of irrigating the plains. The Fountain of Vaucluse is the source of the Sorgues; it rises amid some most picturesque scenery, in a cavern in the secluded valley of Vaucluse (*callis clausa*), midway between Apt and Avignon. The spring is sufficiently copious to form at once a stream capable of bearing a boat. Not far distant from it is the village of Vaucluse, in which Petrarch lived; and between the two is an old castle where the poet frequently resided.

*Climate, Products, and Resources.*—The climate of the department is temperate and healthy; the variations of the weather, however, are rapid, tempests are frequent, and the hail is often destructive to vegetation. The soil is generally poor, and does not produce corn enough for the consumption; rye, barley, and wheat are the chief grain crops. Game is very abundant, and wolves, foxes, and wild boars are found. Of domestic animals the sheep are by far the best and most numerous. The ass and the mule are much employed in agricultural labour. Some of the wines have a good reputation, and are extensively exported. A considerable quantity is distilled into brandy. The best wines are those of Côteau-brulé, Châteauneuf-du-Pape, Sorgues, and Beaugues. The soil yields abundance of truffles, olives, oranges, almonds, walnuts, pears, peaches, plums, apricots, figs, and melons. Saffron, large quantities of madder, artichokes, anise, coriander, fustic, the yellow grain of Avignon (the produce of a species of buckthorn), and the evergreen oak are also cultivated. The number of mulberry trees is very great; silkworms are extensively reared, and honey and wax are abundant.

The minerals include iron, coal, lignite, potter's clay, limestone, freestone, and gypsum, but they are of comparatively little importance.

The principal manufactures consist of silk stuffs (at Avignon and Orange), velvet, woollen fabrics, leather, soap, oil, perfumery, confectionery, printing types, glass wares, wax candles, and mineral acids. Silk and madder mills are very numerous. The chief articles of commerce are grain, flour, clover and lucerne seed, madder, silk, wine, brandy, aromatic and medicinal plants, fruits, lavender, and other essences, wax, honey, and wool. The department is divided into the four *arrondissements* of Avignon, Carpentras, Apt, and Orange. The capital of the *arrondissement* of Avignon and of the whole department is AVIGNON.

**VAUCLUSE**, a village of the above department, 15 miles east of Avignon, celebrated for its remarkable fountain and as the residence of Petrarch when banished from his native land. The fountain is contained in a cavern far up in the side of a deep ravine; when the water is plentiful it overflows in a fine cascade, but at other times is a deep and extensive but dark pool.

**VAUD**, the most westerly canton of Switzerland, is bounded N. by Neuchâtel, E. by Fribourg, Bern, and Valais, S. by the Lake of Geneva, and W. by France. The area is 1245 square miles, and the population 238,730, nearly all Protestants. The central part of the canton is traversed from east to west by a succession of heights and a table-land known by the name of Jorat, which connects the Jura with the Alps, and divides the waters that flow northwards into the Lake of Neuchâtel and the Aar, from those which run southwards into the Lake of Geneva and the Rhône. There are numerous valleys, and the climate varies much in different localities, but is on the whole both temperate and salubrious. The warmest and best sheltered districts are on the east shores of the Lake of Geneva. There the vine is planted in terraces on the slopes of the hills, and its cultivation forms an important branch of rural industry. These vineyards are some of the best in Switzerland, and produce excellent white wines. The canton is essentially agricultural: the highlands of the Jura and those of the Alps on the east, towards the borders of Bern, feed considerable herds of cattle. Fruit trees are abundant, and the forests cover large tracts. The principal trees are ash, elm, alder, and pines (on the mountains): the oak is seldom seen. Large quantities of walnuts, chestnuts, filberts, &c., are grown. The minerals include salt from the springs of Bex (which are almost the only ones of the kind in Switzerland), marble, coal, sulphur, iron, and a few other metals; but mining operations are only carried on to a limited extent, and the quantity produced is very small. The manufactures are unimportant, being merely for the supply of the native population; but there is an active transit trade with France and Germany. The canton is traversed by railways, which connect it with several other parts of Switzerland, and also with France. The inhabitants are industrious and well educated.

The constitution was formerly much more aristocratic than in most of the other Swiss cantons; but it is now a pure democracy. Vaud forms a part of what is known as French Switzerland. The common people speak a dialect of the old Romance language; but the higher classes talk French. The canton holds the nineteenth place in the Swiss Confederation. The principal town is LAUSANNE.

**VAUDEVILLE**, a comic operetta with a great deal of dialogue, or rather a light comedy with songs interspersed. The term is derived from the Old French *Vau de Vire* (or Val de Vire), a district of Normandy, where Olivier de Basselin, a poet of the fifteenth century, wrote satirical songs on topics of the day ("Lais des Vaux de Vire") which became very popular. Plays enriched by ballads of this kind thus gained their name, slightly altered, as Vaudevilles.

**VAUDOIS**. See WALDENSES.

**VAUGHAN, HENRY**, an English poet, who was named "the Silurist," from his having been born among the Silures, or people of South Wales, was a native of Newton-by-Usk, about 5 miles from Brecon, and was born in 1621. He entered Jesus College, Oxford in 1638. In the civil troubles which ensued he was a staunch royalist, and suffered imprisonment on account of his opinions. His first volume of love poems was published in 1646, and in the following year he wrote "Olor Iscannus" (the Swan of the Usk), which was published by his brother Thomas in 1641. Vaughan practised as a physician in Brecon. About 1650, during the seclusion resulting from a severe illness, the poet's meditations were deeply affected by the influence of religion. The tone of his verses became much

more devout, and he gave public expression to his feelings in a work entitled "Silex Scintillans" (Sparks from the Flintstone), which was printed in London in 1650, with a second part in 1655. The book is scarcely inferior to George Herbert's "Temple." His book of devotions, chiefly in prose, entitled "The Mount of Olives," appeared in 1652. Another prose volume, "Flores Solitudinis," followed at no long interval, after the publication of which Vaughan seems to have abandoned literature, and for the remaining thirty years to have confined himself to the exercise of his profession. He died 23rd April, 1695. His works, which abound in happy descriptions of nature and indications of refined feeling, were long neglected. In 1847 an edition of his sacred poems was published by Pickering, which served greatly to revive a just admiration for Vaughan.

**VAULT**, an arched ceiling in masonry. *Barrel Vaults*, simple tunnel-shaped vaults, as it were, like half a barrel (*tonneau*), whence their name, were a favourite mode of roofing under the Normans. Another name for barrel-vaulting is waggon-head vaulting. Only semicircular arches were used. The intersections or groins were very untrue when one tunnel-vault was intersected by another. But this irregularity at once disappeared when the pointed arch came into fashion with Gothic architecture, and intersection, far from being a difficulty, became a chief feature. More and more intersections were allowed, and the introduction of lierne or intermediate ribs made the vault seem even more complex than it really was. Finally, the beautiful and very elaborate fan vaulting of the Tudor style of architecture marked the culmination of the style.

**VAUVENARGUES, LUC DE CLAPIERS, MARQUIS DE**, a French moral philosopher, born at Aix-en-Provence, 1715. He served in the Italian campaign as sub-lieutenant in 1734; but contrived to continue his studies through all the tumult of a camp life. At the early age of twenty-seven, enfeebled by hardships of various kinds, he was obliged to leave the army. While waiting for the result of an application for employment in the diplomatic service, he was seized with small-pox, which prostrated him. In deep seclusion, and in brief intervals of intense pain, Vauvenargues wrote his most beautiful pages, and allowed his intellect to take its loftiest flights. He did not believe in the Christian doctrines, but in a mystic philosophy, which, however, admitted the existence of a God. His principal works were the "Introduction à la Connaissance de l'Esprit humain," and the "Maximes," which gained for him his greatest success. Vauvenargues died in 1747.

**VAUXHALL**, a thickly populated district of London, on the south bank of the Thames, between Battersea and Lambeth, containing the goods terminus of the London and South-western Railway, and several important manufacturing. An iron bridge, built in 1811-16, connects it with the opposite suburb of Pimlico. Vauxhall Gardens, once a fashionable place of resort, have ceased to exist for some years, and their site is now occupied by well-built houses. They appear to have been opened in May, 1660, and during the reigns of Charles II., William III., Anne, and the Georges, enjoyed a high degree of popularity. The principal amusements were tight-rope dancing, concerts, ballets, vaudevilles, and fireworks; and vivid pictures of the scenes enacted in these gardens—scenes often brilliant, always gay, but too frequently licentious—are painted by our satirists and dramatists. They have also been sketched by Thackeray in his "Vanity Fair." Vaux Hall is a corruption of Fulke's Hall, and was anciently the manor and residence of Fulke de Breauté, a trusted counsellor of King John. It was here that Lady Isabella de Fortibus, heiress of William de Vernon, sold her rights and privileges as Lady of the Isle of Wight to Edward III.

**VAYU** is the Hindu god of the winds or of the air.



**VECCHIO, PALMA.** See PALMA VECCHIO.

**VECTORS** are magnitudes which express not only steps of a certain length, but taken in a certain direction also, that is to say, they are "directed steps." It is evident, therefore, that with a vector we can at once fix the position of a second point B, in a plane, with reference to a first point A; the vector AB giving not only the length AB, as in ordinary geometry, but also the direction in which B lies. As applied to the description of the position of a point, this is the method of "polar co-ordinates," and a radius of a circle being used it is called a *radius vector*. See the article RADIUS and its illustration.

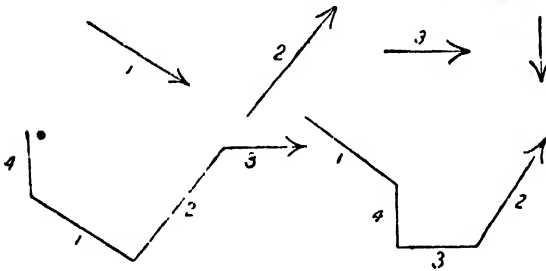
The addition of vectors is therefore something quite different from the addition of ordinary lines. In vectors,  $AB + BC + CD$  means to proceed from A to B by a certain direction and at a certain distance, thence to proceed in like manner to C, and from C in the same way to D. If from D we returned to A, we might state the operation by the formula,

$$AB + BC + CD + DA = 0,$$

the zero being equivalent to no motion, and therefore well representing a process which leaves us just where we started from. Or it may be expressed by the formula

$$AB + BC + CD = AD,$$

where the order of writing A D instead of D A implies that the motion is reversed, and expresses the agreed fact that any one starting from AB along the direction and to the length given by the vector AD, would arrive at the spot



D, which might also be reached by means of the vectors AB, BC, and CD. If lines are taken to represent vectors, and arrow heads attached to them to show their direction, they may be geometrically represented, and their united effect shown graphically, care being taken that in combining them the direction of the motion follows a continuous sense. That is to say, two vectors cannot meet in a point which they approach from opposite directions, but one must be taken to the point and another from it. The order in which the vectors are added makes not the slightest difference to the result. Two additions of the vectors 1, 2, 3, 4, are appended as illustrations of this.

**VE'DAS**, the most ancient Sanskrit scriptures. See INDIA.

**VEDETTE** or **VIDETTE**, a dragoon or horseman stationed on the outpost of an army to watch an enemy and give notice of danger.

**VE'DIC HYMNS.** See INDIA.

**VEGA CARPIO, LOPE FELIX DE.** See LOPE FELIX DE VEGA CARPIO.

**VEGETABLE BUTTERS.** See BUTTERS, VEGETABLE.

**VEGETABLE IVORY.** See IVORY PALM.

**VEGETABLE KINGDOM.** See BOTANY.

**VEGETABLE MARROW** (*Cucurbita orisera*, Linn.), one of the most useful of the gourd family, is considered to be a variety of the Common Gourd or Pumpkin (*Cucurbita pepo*). It is believed to have been introduced from Persia about 1815, since which date it has been in

general cultivation in England for culinary purposes. It is one of the most hardy of the common gourds, which it resembles in habit and appearance. The fruit, the vegetable marrow of our tables, is of an elongated oval shape, smooth or slightly ribbed, and generally of a uniform pale greenish-yellow colour. It is usually about 9 inches in length and 4 in diameter, but much larger specimens are often produced. The name refers to the peculiar tenderness and softness of its flesh substance. It is easily cultivated in any garden.

**VEGETABLE MORPHOLOGY.** See MORPHOLOGY, VEGETABLE.

**VEGETABLE PARCHMENT.** See CELLULOSE.

**VEGETABLE PHYSIOLOGY.** See PHYSIOLOGY.

**VEGETABLE TISSUES.** All plants are derived from, and, in their ultimate constituents, consist of cells. [See CELL.] In all except the lowest plants, however, the cells building up the plant are more or less modified and transformed, giving rise to layers or masses of cells, which present a certain agreement among themselves in growth, shape, and function, but differ from neighbouring masses of cells. Such a mass of cells is termed a *tissue*; and several forms of tissue, connected together to form a whole of a definite physiological character, constitute a system of tissues.

Tissues originate from cells generally by the repeated division of common mother-cells, forming a mass of daughter-cells, connected with one another by their common walls. Frequently the partition-walls between adjacent cells become partially or wholly absorbed, forming pits or cell-fusions. The vessels are cell-fusions formed by the absorption of the transverse walls through whole rows of cells.

Intercellular spaces are sometimes found between the cells of a tissue formed either by the splitting of the common wall of two cells, or by the drying up and rupture of masses of cells.

Two main forms of tissues may be recognized, *parenchyma* and *prosenchyma*. The parenchyma cells are the typical form of all true cell-tissue. They are usually the largest in the body of the plant, more or less roundish or polyhedral, thin-walled, containing protoplasm and a quantity of watery sap. The prosenchyma cells are elongated and narrow, with their ends overlapping, without intercellular spaces: these cells form the fibres of the wood and bast. When the cell-walls are greatly thickened the name *sclerenchyma* is given to either form of tissue.

**Systems of Tissue.**—Three systems of tissue are obscurely indicated even in the higher Algæ, and clearly differentiated in vascular plants—the epidermis, the fibro-vascular bundles, and the fundamental tissue.

The epidermis, the protective tissue, is developed chiefly on the shoots and leaves exposed to the air. Its function is to hinder the evaporation of the fluids in the cell-tissue, and to prevent injurious influences from entering from without; and by means of its pores or STOMATA to bring about transpiration, and permit of the entrance of the gases necessary for the plant. It consists usually of a single layer of closely-fitting tubular cells. The external walls of the cells are usually considerably thickened, and their outermost portion forms a continuous pellicle or cuticle. Particles of wax are sometimes formed in the outer wall of the epidermis and in the cuticle, to prevent the entrance of rain or dew. The epidermal cells rarely contain chlorophyll. Hairs, varying greatly in appearance and structure, are frequently developed on the epidermis; they are not, however, peculiar to it, but are often developed in internal tissues where large intercellular spaces afford room for their growth.

The fibro-vascular bundles form the channels by which the nutriment absorbed by the roots is conveyed to the

leaves, and the products of assimilation distributed thence throughout the plant. The former of these functions is performed by the wood (*xylem*), the latter by the bast (*phloem*). The fibro-vascular bundles are usually common to leaf and stem, and occur also in the root. The arrangement of the bundles in phanerogamous plants is described in the article *EXOGENS*. In the vascular cryptogams (ferns, club-mosses, &c.) the bundles form an axial cylinder, the phloem surrounding the xylem, and are incapable of further growth. Slight indications of a fibro-vascular system are found in the Muscinæ (liverworts and mosses). See *FIBRO-VASCULAR BUNDLES*.

The fundamental tissue consists of all the masses of tissue which are inclosed by the epidermis and traversed by the fibro-vascular bundles. The portion of fundamental tissue lying beneath the epiderm is known as *hypoderm*. In the stems and leaf-stalks of dicotyledonous plants this hypoderm takes a very characteristic form, known as *collenchyma*; the cells being narrow and elongated, with pad-like projecting thickenings deposited in the angles of the cells, which swell up considerably in water. There is frequently a layer of fundamental tissue, forming an investment or sheath for the fibro-vascular bundles; this is known as *endoderm*, and is particularly well marked in all vascular plants. In palms and many monocotyledons the bundle-sheath consists of a layer of very thick-walled woody spindle-shaped fibres (*sclerenchyma*). The fundamental tissue of the leaves containing chlorophyll grains consists of two kinds of parenchymatous cells; the upper surface of the leaf consists of tissue built up of narrow, elongated, oblong cells (*pallisade parenchyma*), fitting closely together, while that of the under surface consists of spongy parenchyma, composed of cells irregularly arranged and separated by large intercellular spaces. Fundamental tissue, which is actively growing, as in the apices of stems and roots, is called *meristem* or generating tissue. Of this nature is the *CAMBIUM-LAYER* between the wood and bast of the fibro-vascular bundles of dicotyledons. See also *GLAND* and *LATICIFEROUS VESSELS*. For details see the text-books of Sachs and De Bary, and Sachs' "Lectures on the Physiology of Plants."

**VEGETABLE WAX.** See *WAX, VEGETABLE*.

**VEGETARIANISM**, the name given to the theory that vegetable substances only are the proper food of man, or to a modification of that theory which permits the use of such animal products as eggs, milk, cheese, and butter, but excludes all flesh, whether that of animal, bird, or fish. Speculations as to the best form of diet have been indulged in by thoughtful men from a remote period, and some very illustrious names—including those of Buddha, Pythagoras, Plato, Seneca, and Plutarch among the ancients, and of Milton, Newton, Linnaeus, Swedenborg, Franklin, Lamartine, &c., among the moderns—may be cited in favour of the opinion that vegetarianism in its complete or modified form is the best system for mankind. Of late years the subject has been brought with increasing prominence before the public mind in Great Britain and America by a band of zealous dietetic reformers, who, while they include a fair sprinkling of "cranks" and "faddists" among their numbers, have also enlisted many persons of undoubted ability in the defence of their cause. In England they have established a vegetarian society, having central offices in Manchester and London, and they endeavour to propagate their views by means of lectures, public meetings, cookery lessons, cheap or free meals of vegetable food, the encouragement of vegetarian dining-rooms and restaurants, and the circulation of a very large quantity of literature. In the majority of cases the advocates of vegetarianism are champions also of the principle of total abstinence from alcoholic drink, and some associate it with other measures of social and sanitary reform. Stated very briefly, the more

thoroughgoing vegetarians claim that the non-animal kingdom may be easily made to furnish a perfect diet, and one suitable to all conditions of human life; that animal food is always liable to be tainted by disease and impurity; that its use involves all the horrors of the slaughter-house; that the habitual eating of flesh begets a callous indifference to the sufferings of animals and also of men; that it is injurious to health, in that it excites and stimulates the system in an unwholesome degree; and that the use of meat tends to promote intemperance. It is further claimed that the universal use of vegetable food would be followed by such a re-arrangement of the cultivation and employment of the land as would enable a much smaller extent to support its population than that which the present system requires, hence a vegetable diet is more economical than a mixed one; and lastly, that a fair trial of the system for any length of time will convince any unprejudiced person in its favour.

It must be admitted that the vegetarians have proved by experiment that hard and prolonged physical toil can be sustained on a vegetable diet, and that it is also no hindrance to a life of mental labour, some of the hardest workers and clearest thinkers being included among their ranks; but on the other hand the opinion of most modern physiologists is unfavourable to vegetarianism, and among northern nations, at any rate, the use of meat appears to be conducive both to health and energy. Apart from all controversial matters, however, the modern vegetarians have done the community good service in showing that very little animal food is necessary to support the body in health, and by their adding to the general dietary a large number of wholesome and palatable vegetable dishes. See also the articles *FOOD* and *DIGESTION*.

**VEHICLES** or **MEDIUMS** are the liquids in which pigments are ground down so as to enable them to be applied in painting. In fresco painting and in water-colour drawing simple water is used, or frequently a little gum is added, which gives depth to shadows, or wax-water megyl serves the same purpose; and in spirit-fresco oil of spike is the solvent. In the ancient tempera painting white of egg and fig sap, or vinegar when the fig sap was not procurable, formed the unsavoury vehicle; in modern distemper weak size is used. In ancient encaustic painting wax was the vehicle.

The fixed oils of linseed, nut, and poppy are used in oil-painting, and of late years a growing use of petroleum has sprung up. The vehicle called megyl is now not so much in favour, because it is held to destroy the permanency of the picture.

**VEHM-GERICHTE.** See *FRIBRE*.

**VEII**, the rival of Rome during the small beginnings of the imperial city, was one of the chief towns of Etruria, and lay about 12 miles from Rome. Antiquarians were long uncertain as to its exact site, but it is so probable as to be now generally agreed that Isola Farnese, on the Cremera, stands upon the ruins of Veii. Although the town has so completely disappeared, it was in its days of splendour no inconsiderable place. We are told that it was as large as Athens, and we know that it was the leading town in the powerful Etruscan league ("league of the twelve cities"). The ruins at Isola Farnese are 7 miles in circumference and stand on a precipitous hill; which, as with most of these ancient Etruscan towns, is approachable (except by a steep climb) only by one narrow ridge connecting it with the neighbouring hills. From the first foundation of Rome Veii was at war with her; fourteen wars may be readily counted in three centuries. At last, shortly after the expulsion of the Tarquins and the founding of the Roman republic, the cities of Etruria under their Lars or chief, Porsena, conquered and held Rome for some short time, though the legend tries hard to conceal the unwelcome fact. It appears by the legend itself, however, that Por-



seena received an ivory throne and a gold sceptre, the recognized tokens of kingship introduced by Tarquinius Priscus; and, besides, Tacitus expressly says the city was surrendered to Porsena, while Pliny tells of a treaty forbidding the Romans to have any iron except in the form of agricultural implements. Subsequently Rome's great enemy fell, and the Etruscan yoke was thrown off. But Veii profited by the misfortunes of the young republic to harass it continually; therefore the powerful gens of the Fabii undertook to build and hold a frontier post. About 300 fighting men and 600 or 700 followers left Rome and fortified a camp on the Cremera, where they kept the Veientes in awe for a year. Then the men of Veii caught the Fabii unawares as they were on a journey to Rome to fulfil an annual sacrifice, and slew them all by the Cremera. One Fabius escaped, for he was a boy and had been left at home in Rome. He became the ancestor of the later Fabii.

Rome now granted a peace to Veii, and for forty years was gaining strength—Veii, on the other hand, in common with other Etruscan cities, being pressed upon by the Gauls, who had crossed the Alps and occupied the entire plain of Lombardy and the neighbouring countries from the Alps to the Adriatic, territory formerly Etruscan in the main. By 405 B.C. the Romans were strong enough to pick the first quarrel that offered with Veii, and quickly drove them within their walls and invested the city. The investment of Veii lasted ten years, so says the legend. Then an old Etruscan prophecy was revealed, which said that Veii should not fall until the waters of the Alban lake (an old volcanic crater) were drained without being carried to the sea. The Romans engaged in the work of draining the Alban lake, and the tunnel of 3 miles through hard volcanic rock which they made for the purpose, a magnificent piece of simple engineering, still stands. The water was dispersed by ditches along the fields at the mouth of the outfall. The Veientes trembled when they heard of this, but their courage rose again at a second prophecy which they called to mind—"If Veii fall Rome shall fall also." Meanwhile Camillus, dictator of Rome, had mined into the hill of Veii; and as he stood with his soldiers ready to burst through into the citadel he heard the King of Veii offering sacrifice, and the soothsayer declaring that whoever completed the offering his city should be the conqueror. So Camillus and his men came forth, and slew the king, and completed the sacrifice to Juno. The statue of the goddess bowed in sign of favour to them, and as soon as the city had surrendered, this statue was carried to Rome and housed in a magnificent temple on the Aventine. Not only Veii, but the subject territories, fell into the hands of Rome (B.C. 395).

Five years later, B.C. 390, the Gauls, whose attack on other cities of Etruria had left Veii unaided, and so caused her fall, crossed the Apennines, fell upon Rome, and sacked it, thus fulfilling the second prophecy. The mass of the citizens and all the women found a refuge in the now deserted Veii, and it was seriously in debate whether it would not be better to remove the city thither. It was only at the earnest instance of Camillus that the original site was adhered to, and Rome soon rose again.

Veii after this disappeared as a city. The Emperor Augustus planted a considerable colony there; but it was in vain: the colony had already died out in Hadrian's time.

**VEINS** are the bloodvessels which conduct the dark or impure blood from the tissues of the body back to the heart, to be driven through the lungs and restored to its bright colour and vital properties. In describing the veins of the human body we commence at the branches, and proceed along the trunks to the heart. The veins are much more numerous, and of greater capacity than the arteries, so that the blood moves in them much more slowly. They do not pulsate like the arteries, for the impulse of the

heart is nearly lost upon them; and hence, when opened, the blood does not flow from them in jets, but in an equable stream. They consist of three coats, an outer one, which is very distensible, so that the vein can swell very much; a middle coat, much thinner than the middle coat of the arteries, of unstriped muscular fibres, mixed with elastic and fibrous tissues (except in the large veins of the heart and lungs, which have for a middle coat ringed muscular fibres, continuous with those of the auricles); and an internal one, which is smooth, and in many respects similar to the lining membrane of the arteries. There is one striking difference between them and the arteries, that they usually have valves placed at distances of an inch or two, which prevent the blood from flowing backward from the heart towards the extremities. The "valves" of veins are like the pouch-like semilunar valves of the aorta and pulmonary artery, but of course their free margins are turned the reverse way—i.e., towards the heart: directly the blood tries to flow back from the heart these valves are filled and distended, and being in pairs they meet, and almost or entirely block the passage. There are usually no valves in veins of less than a twelfth of an inch in diameter, and also none in veins like the *venæ cavae*, pulmonary vein, &c., not subject to muscular pressure. Hence is the use of tying a fillet round the arm previous to "bleeding;" the blood is constantly arriving from below, because the pressure is not great enough to obstruct the arteries; but it cannot get up past the bandage; the veins are therefore distended, and become prominent, so as easily to be seen and punctured; and then, as the blood cannot get down the arm again, because of the valves, it is necessitated to jet out at the orifice. The veins in the limbs lie in two sets, a deep-seated and a superficial. The deep set lie alongside of the arteries, there being generally two to each artery; the superficial lie immediately under the skin, and above the fascia or sheath of the limb, and these two sets have every here and there branches communicating between them. Hence, when pressure is made by the muscles on the deep set, the blood escapes into the superficial, and finds by that road a passage to the heart. The reasons why old-fashioned surgeons in letting blood always selected the veins are twofold—first, that they are more easy of access than the arteries; and second, that they heal readily, by the mere application of a bandage.



Portion of a vein split open lengthwise and folded back flat, so as to show two pairs of valves.

On the back of the hand, the veins lie above the extensor tendons, escaping the pressure to which they would have been subjected in the palm. They then take their course up the front of the forearm, and over the elbow, where one of the largest runs directly over the artery. Above the elbow most of the veins dip deep to accompany the artery, and in the arm-pit the vein is nearly the size of one's thumb. Passing up under the collar-bone, it meets the deep jugular vein at the root of the neck. These two there form a large vein, which meets a similar one on the opposite side, and these, again uniting, form the descending great vein, which pours the blood from the head and upper extremities into the right auricle of the heart.

On the head a number of veins collect from the scalp, and form a vein in front of the ear—the temporal vein. Below the angle of the jaw this receives the vein from the face, and then the one from the tongue, and forms the external jugular vein, which passes down the side of the neck to the collar-bone, and joins the great vein of the upper extremity. The blood which has been circulating in the brain comes out of the cranium by two large holes, one on each side, and forms the deep jugular veins. These

receive the branches from the deep part of the face, and form a vein as thick as one's thumb—the deep jugular, which lies close to the carotid artery.

The blood of the lower extremities is collected by veins placed on the back of the foot, that they may escape pressure; and from these one large vein passes up the inside of the leg, and another along its back, with a multitude of smaller branches, which keep up a communication between them. Besides, there are, of course, two deep-seated veins to each of the three arteries of the leg, all of which unite in the ham to form the great vein of the limb, lying close upon the main artery. The vein on the back of the leg here joins this vein. The deep vein then continues up alongside of the femoral artery, till in the groin it passes over the share-bone, and enters the abdomen. The superficial vein on the inside of the leg joins it 3 or 4 inches before it enters. The two great veins of the two lower limbs now pass up to meet one another, beside where the aorta bifurcates, receive the blood from about the pelvis, and form the inferior great vein. This vein, about an inch in diameter, now passes up through the belly on the right side of the spine, and receives the veins from the kidneys, and some other small ones. Just before passing through the diaphragm, where, in a large man, it will be nearly 2 inches in diameter, it receives four or five large veins from the liver. The blood from the stomach, spleen, and intestines takes a curious course. These veins meet and form a large vein, which goes to the liver, where, instead of joining the great vein at once, it divides like an artery, ramifies through the liver, and then returns its blood by the four or five large veins just mentioned. This is the so-called "portal circulation."

*Diseases of the Veins.*—Veins are more subject to diffuse inflammation than arteries, and, from their active absorbent powers, morbid materials are carried rapidly and widely over the system from the heart. Phlebitis, or inflammation of their lining membrane, is a dangerous and common disease, sometimes leading to fatal purulent absorption, the formation of a thrombus or mass of coagulated blood in the vein, and frequently to obliteration of the vessel. Varix, or dilation of a vein, from the comparatively small amount of circular fibres, is one of the most frequent of the morbid conditions of the body. [See VARICOSE VEINS.] Small earthy concretions are not unfrequently deposited in the walls of veins from the blood; they are named phlebotoliths or vein-stones, and consist chiefly of phosphate and carbonate of lime. A vein if wounded generally heals kindly, without interference with its functions, and the healing is so complete that usually no scar even can be found in the injured vein. A wound in the axillary, subclavian, or lower part of the internal jugular, however, may prove suddenly fatal from the entrance of air into the vein. See also WHITE LEG.

**VEIN-STONE**, the material of lodes or mineral veins. In metalliferous veins the ore occurs in strings, nests, or scattered crystals, and the enveloping veinstone is commonly known as gangue or vein-stuff. See MINERAL DEPOSITS.

**VELA'RIMUM**. The great awning which, by means of tackle, was hoisted over the Roman theatre or amphitheatre, to protect the spectators from the rain or sun's rays. The masts which supported the pulleys ran through stone sockets in two of the external mouldings of the cornice, and are still visible in several of the ruins of these great buildings, for instance, in the theatre at Orange, the Colosseum at Rome, &c.

**VELAZQUEZ, DIEGO RODRIGUEZ DE SILVA** (more usually called, in England at least, *Velasquez*), the greatest of Spanish painters, and among the greatest of all portrait painters, was born at Seville, 6th June, 1599. Having manifested, while yet a child, a decided bias for drawing, he was placed under Francisco Herrera el Viejo.

Driven by ill-usage from this studio, he entered that of Francisco Pacheco, who was the very opposite of Herrera in all respects. The mediocrity of this master happily had no influence upon Velazquez. After five years of purely nominal instruction he married Juana, Pacheco's daughter, and, thrown on his own resources, the young artist turned to nature for his guide, and he followed her faithfully to the end. His pictures of this period are very scarce. The "Adoration of the Shepherds," now in the Louvre, is the earliest of his undoubted productions, but it is nothing more than a copy from Spagnoletto.

In the spring of 1622 Velazquez visited Madrid, and diligently studied the great Italian works in the galleries there. He then returned to Seville, but was recalled to the capital the next year by Olivarez, the prime minister, and having successfully painted his portrait, stepped at once into fame and fashion. He was forthwith appointed the court painter; and Philip IV. ordained that no one but Velazquez should paint the royal likeness. This was not all. The painter pleased the king so much that some of the more intimate court offices were given him, that he might be near the king freely, and he was all his life reckoned among those very few friends of the proud gloomy prince who bore the title of *privados del rey*.

Obtaining the king's permission to travel in Italy, he embarked at Barcelona on 10th August, 1629. He visited Venice, Ferrara, and Rome, being everywhere received in an artistical triumph. Urban VIII. assigned to him an apartment in the Vatican, where he diligently studied the works of Raffaele and Michelangelo, copying minutely a large part of the "Last Judgment" of the latter, and the "School of Athens" of the former. He remained a year in Rome, and only sent home two original pictures, his "Jacob with the Garment of Joseph," and "Apollo at the Forge of Vulcan." Both are now at Madrid. From Rome he passed to Naples, then a Spanish possession, where he derived much enjoyment from the works of Caravaggio and his countryman Ribera.

He returned to Madrid early in 1631, and there painted the magnificent equestrian portrait of Philip IV., from which a model was made and was cast in bronze by Pedro Tacca, now in the gardens of the Buen Retiro. In November, 1648, he made a second journey into Italy, in order to purchase modern pictures for the king, and procure moulds from the best antique statues for a projected academy. At Rome he painted the portrait of Innocent X., which is now the gem of the Doria collection, and was elected a member of the Academy of St. Luke.

We find him once more at Madrid in 1651, in the full power of his genius, and painting his finest pictures. In 1656 he received the much-coveted cross of Santiago, and about the same time was raised to the lucrative and honourable post of Aposentador Mayor. In 1660 he was sent to prepare the royal quarters during the journey from Madrid through the ill-provided Castiles to the Bidassoa. Worn out with the fatigue of this troublesome task, he fell sick, and died, after a very brief illness, on 7th August, 1660. In less than a fortnight his wife, broken-hearted at his loss, followed her gentle and excellent husband, and was laid by his side in the Church of San Juan.

His genuine and finest works remain at Madrid: in most Spanish cities they are quite as rare as in every other part of the world. There is no branch of the art, except the marine, and, we might almost add, the sacred, which Velazquez has not pursued, and he attained almost equal excellence in all. His portraits baffled description and surpass praise. This great artist literally drew the minds of men: his characters live, breathe, and seem ready to walk out of the frames. The two portraits of Philip IV. in our National Gallery are wonderful masterpieces. One of them in particular is admirable, and is not only the best portrait we possess, but is scarcely second to any in the world. He

had a wide range of subjects, and was almost perfect throughout, whether painting high or low, rich or poor, young or old, human, animal, or natural objects. His dogs are equal to those of Snyders; his horses to those of Rubens. His beggars and urehins rival those of Murillo. Neither Teniers nor Hogarth ever came up to the wassail of his drunkards. But Velazquez is also indisputably the first landscape painter of Spain: every scene he has painted is full of local colour, freshness, and daylight, whether a verdurous court-like avenue or a wild rocky solitude. His historical pictures are pearls of great price.

**VELDE, VAN DE**, the name of a family of great Dutch artists. Willen van de Velde the Elder (1610-93) was a marine painter of distinction, who engaged in the service of Charles II. and James II. of England, and received a salary of £100 a year (a much more considerable sum than that now) "for taking and making draughts of sea fights."

Adriaan van de Velde (1629-72), a pupil of his father and of the excellent landscapist, Jan Wynants, attained great reputation for landscapes of a smooth peaceful charm. He is especially happy in the figures and animals which he introduces; and, in fact, was often engaged by other Dutch landscape artists to embellish their canvases in this way. The National Gallery possesses six good examples of the master.

Willen van de Velde the Younger (1633-1707), brother of Adriaan, was taught chiefly by his father and also by Vliager. When the elder Van de Velde had received his appointment at the newly restored court of Charles II., the son joined him in England and soon received a similar engagement to his father's, his duty being the "putting into colours" the "draughts" of his father. The two artists lived and worked at Greenwich. The younger Van de Velde soon quite eclipsed his father, and sprang to that unrivalled position in his particular walk of art which he has ever since held. His devotion to his art was very great. Thus, in the great battle of 1666 between De Ruyter and the English, which lasted four days, Van de Velde was actually on board one of the vessels of his countrymen, in the thick of the fight, making sketches for the splendid picture now at Amsterdam. The National Gallery has fourteen splendid examples of the master, and there are many in private collections in England, for he made our country his adopted home. There is a large collection of monochrome studies and sketches, and of sepia drawings of marine subjects, by this great artist, many of them of marvellous beauty, in the Louvre at Paris. The subdued colour of Van de Velde's finished pictures is very fine in its way, but many moderns would prefer the brilliancy and dash of these drawings. Each of them, moreover, is scrupulously finished, in marked contrast to the unintelligible jottings which many artists of our own time are contented with as sketches.

**VELEIA**, the Pompeii of Northern Italy, an ancient city at the base of the Apennines, 23 miles south from Piacenza, and 45 miles from Parma by the existing roads. Under the empire this place was a municipium. At some time, probably about the fourth century of our era, the town was destroyed by a landslip. This catastrophe was probably caused by the waters of a small lake high up in the mountains of Moria and Rovinazzo, 2 miles from the city.

The first discovery on the spot was made in 1747, when the bronze tablet of Trajan (Tabula Alimentaria, as it is called) was found there. Excavations were made in 1760 by the order of the Duke of Parma, when the foundations of the forum, and of other buildings, were discovered, with statues, medals, money, and small implements of various kinds. Another bronze tablet was also found which contains a portion of a Roman law for regulating procedure in Gallia Cisalpina. The ruins which have been excavated

show the plan of the forum and of the amphitheatre. In the former stood a basilica. The city was well provided with sewers and drains. The museum of Parma is rich in bronze statues, marble inscriptions, and in bronze stamps for marking goods or pottery, collected in the excavations.

**VELITES** (Lat. *velitor*, to skirmish), the light-armed infantry of the Roman armies, so called from their agility and swiftness. They were first instituted during the Second Punic War, and were armed with javelins, bows, and slings; and their cuirass, casque, and shield were of a very light construction. Stationed in loose order before the army, they were employed when occasion required. Sometimes they were disposed before the front of the Hastati, sometimes dispersed up and down among their void spaces, and sometimes placed in two bodies in the wings. The Velites generally began the combat, skirmishing in flying parties with the first troops of the enemy, and, when repulsed, falling back by the flanks of the army, or rallying again in the rear. Their tactics corresponded, in some measure, to those of the skirmishers, or rifle corps, of modern armies.

**VELLETRI** (the ancient *Velitræ*) is a walled city of south Italy, 21 miles E.S.E. of Rome, on the railway to Naples. It stands on a height, commanding fine views of the sea, the Campagna di Roma, and the Pontine marshes, and has a town-hall, constructed by Bramante, a palace with a very handsome marble staircase, and an old cathedral. The Borgian museum and picture gallery, now in Naples, and the Propaganda College at Rome, were originally formed in the Borgian Palace of this town. The inhabitants, who are principally employed in agricultural pursuits, number about 10,000. The neighbourhood is celebrated for its wines. Velitræ was an important city of the Volsci, and the original residence of the Octavian family. Augustus was born here B.C. 63. On the hills to the north Charles III. of Naples gained a victory over the Austrians in 1741, which secured the two Sicilies to the Spanish branch of the house of Bourbon. The modern town is surrounded by ruined walls and towers.

**VEL'LO** (Spanish *Vellon*; Latin *Vellus*; English *fell*, a fleece), the Spanish term answering to our sterling. The Spanish *Reale de Vellon*, the *Ducado de Vellon*, and the *Maravedi de Vellon* are among the most esteemed coins of the older Spanish currency.

The term, like the Latin *pecunia* (from *pecus*, cattle), is derived from that far bygone age when cattle, their hides, and their fleeces, were the money currency. The "money of the fleece" (*de vellon*) would long remain the only real money in the popular view, even after the introduction of metallic tokens; and when the actual fleeces no longer passed from hand to hand, the purest metallic representations of them, those which gave the full true value in metal for their reputed amounts, would easily acquire and perpetuate the honourable distinctive title of the ancient fleece-money.

**VELLORE** (*Vellur*, *Rayi Velliur*, *Raya-ellurn*), a town in North Arcot District, Madras, situated on the river Palar. It is a military station, the headquarters of the sub-collector of the district, and a municipality; it contains courts, military offices, central jail, church, missions, hospital, also post, telegraph, and several departmental offices.

For more than twenty years the fort was the stronghold of Murtiza Ali, who defied the authority of his relative and lawful chief, the Nawab of Arcot and his English allies. The latter marched against the town in 1756, but retired without making any serious effort. Murtiza Ali held the fort till 1760, when again an English force appeared before its walls, retiring at the earnest entreaty of the *kiladar*. A few years later, however, it was occupied by an English garrison, and in 1768 was threatened by Haidar Ali. In 1780 Haidar regularly invested the place, which held out

against overwhelming numbers and innumerable difficulties. A dozen times in the course of the siege there was not rice for three days' consumption, and all the energies of the Madras government and of Sir Eyre Coote were devoted to throwing in supplies. The siege lasted for two years, when it was raised by the advance of an army from Madras and Haidar's death. In 1791 Vellore was the basis of Lord Cornwallis' march on Bangalore. After the fall of Seringapatam (1799) the family of Tipu were detained here; and to their intrigues has been attributed the revolt of the Sepoys at Vellore in 1806, when all the officers and other Europeans were massacred. The revolt was promptly put down by Colonel Gillespie, and the Mysore princes removed to Bengal. Besides its imposing and picturesque fortress, which contains many interesting buildings, Vellore possesses a handsome Vishnuvite temple with some good carving. Chanda Salib's mosque is also deserving of mention. The town, although hot, is healthy. The municipality has done much to improve it. Population, about 40,000.

**VEL'LUM** is the fine parchment from the skins of calves, used for purposes of writing or illuminating, or for very luxurious printing, such as presentation copies of expensive works, or for binding, &c. See PARCHMENT.

**VELO'CIPEDE.** See TRI-CYCLE.

**VELO' CITY,** the name given to the proper measure of the speed with which a change takes place. When the speed is always the same the velocity is measured by the work done in a unit of time: thus we speak of 10 miles an hour, meaning that in every fraction of an hour the corresponding fraction of 10 miles is moved over. When the speed is not uniform the proper measure of velocity requires the introduction of those considerations on which, as far as its principles are concerned, the differential calculus is founded.

Velocity is at once seen to be divided into uniform and variable velocity. As for the first, we measure it and calculate it by the number of feet passed over in a second: therefore, if  $s$  be the space passed over in feet, and  $t$  the number of seconds occupied in the motion, and  $V$  the velocity, then,

$$V = \frac{s}{t}$$

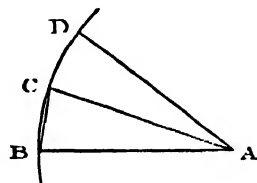
or in other words the velocity is the quotient of the time into the distance. Two velocities may be combined in exactly the same way as forces, their composition being shown graphically by the same diagrams as those which serve for the triangle or the parallelogram of forces. Or several velocities may be combined, and the velocities represented by all the sides of a polygon save one are balanced by the velocity of that side, taken in reverse order. Similarly a velocity is resolvable into two velocities of different directions by the same construction.

The calculation of varying velocities introduces another element, the acceleration or retardation, according to the positive or negative direction of its action. Retardation is always expressed as negative acceleration; thus a retardation of 10 feet per second would be expressed as an acceleration of minus 10 feet ( $-10$ ).

The action of gravity represents an excellent and a simple illustration of a uniformly accelerating force. The rate of acceleration is about  $32.2$  feet per second. If, therefore, a stone be let fall from rest, and fall  $t$  seconds, it will have a velocity at the end of that time of  $t$  times  $32.2$  feet. Suppose we desire to know how far it will have fallen, we take an average of the velocities, namely, an average between zero and  $(32.2)t$ , which gives  $(16.1)t$  as the average velocity. Now since  $s=Vt$ , the space passed over in  $t$  seconds will be  $t$  times  $(16.1)t$ , for this last quantity is the average  $V$ . Therefore,  $s=(16.1)t^2$ . Hence the rule in this case, that the spaces traversed in feet are as the squares of the times in seconds multiplied by  $16.1$ .

If the stone were thrown straight upwards with a velocity  $v$ , gravity would be counteracted to this extent, and its velocity at the end of  $t$  seconds would be  $v-(32.2)t$ ; whence it follows that after  $\frac{v}{32.2}$  seconds have passed the stone will begin to descend. If the stone be thrown straight downwards with a velocity  $v$ , its total velocity after  $t$  seconds will be  $v+(32.2)t$ . In these formulæ the resistance of the air is neglected, but at high velocities this resistance becomes very considerable, and largely modifies the formula by correction.

There remains one other class of cases within the limited scope of this article to consider. This is the general view of what happens when acceleration is imparted in a direction different to that of the original motion. The problem becomes somewhat akin to the composition of velocities. Let a body be moving (say a planet in its orbit) along the path  $BCD$ . Let the point  $A$  be such that  $AB$ ,  $AC$ ,  $AD$ ,



Sir W. Hamilton's Hodograph.

&c., drawn to points along the path, represent in length and direction the velocity of the body. Then  $BC$  represents the change of velocity—i.e. the acceleration between  $B$  and  $C$ —and the closer together we take  $B$  and  $C$ , the more nearly will  $BC$  become a tangent to the curve. If we think of  $BC$  as infinitely small, we may then regard  $BC$  as a tangent to the curve at  $C$ , and therefore the tangent as representing the direction of the change of velocity. This diagram is the clever hodograph of Sir William Hamilton. It is at once evident that if the motion be uniform the hodograph will be a circle whose radius is the magnitude of the velocity, and whose acceleration is in a direction perpendicular to the direction of motion; that is, with velocity  $V$ , radius  $R$ , the acceleration of uniformly accelerated motion is  $\frac{V^2}{R}$ , and is directed towards the centre of the circle.

Therefore to keep a body moving in a circle, like a stone whirled at the end of a string, it must be perpetually drawn in by a force directly as the square of the velocity, and inversely as the radius. In common language we commit the absurd error of precisely inverting the truth and speaking of a *centrifugal force*; that is, one which perpetually urges such a body to fly off at a tangent to the circle of its orbit. It is needless to add that the sun's attraction of gravitation is this controlling force which compels the planets to revolve in their approximately circular orbits around him. The circular path of the moon around the earth, neglecting corrections, is in like manner the curve compounded of the motion of the moon herself and a perpetual falling inwards towards the earth, due to the pull of gravity. Motion uninfluenced is of course always in a straight line.

**VELVET** (Old English *velouette*, from Old French *velous*, Lat. *villous*, hairy), a textile fabric woven wholly of silk, or of silk and cotton mixed, having a loose pile or short slag of threads on the surface, which gives it a fine soft nap. Cotton stuffs manufactured in the same way are commonly called velvetens. It is supposed that the art of weaving velvet originated in China, but it was practised in Europe as early as the thirteenth century. The art was for a long time limited to the Italian cities, from whence it passed into France, where it was greatly

improved, and in 1685 it was introduced into England by French refugees. In mediæval times velvet was much valued for ecclesiastical vestments and costly church draperies. It is a very durable material, from the close texture of the under side, and also from the thick nap of the upper, which opposes great resistance to external friction. It is, moreover, very warm, and suitable for rich ornamental figured work. Its peculiar character is derived from the insertion of short pieces of thread, secured under the shoot, weft, or cross threads, their ends standing upright and so closely together as to conceal the interlacing of the threads beneath. They are furnished by an extra set of threads called pile-threads, arranged in the loom parallel to the warp-threads, and much longer than these, which, in the process of the weaving, are passed, after every third throw of the shuttle, over a thin, semi-cylindrical, straight brass wire, which is laid across the whole fabric, over the warp threads. The next working of the treadle carries the pile threads down over the wire, when they are covered and fastened by the next throw of the shuttle. Another wire is placed in the same position for the next row of loops across the fabric, and these are produced, as already observed, with every third throw of the shuttle. Two wires only are used, and these are freed in turn by the same process which converts the loops into a pile. Each of them has a groove along its upper surface, and on this is run a sharp-edged knife, thus severing the loops and leaving two ends of each one projecting above the fabric. These are brushed up and dressed to produce the velvety nap. If some of the pile-threads are left uncut the velvet is then of the striped kind; and some are used altogether uncut. In earlier times patterns were woven in velvet by introducing pile of different colours, or the same colour in different lengths, the Italians and Flemings excelling in this style of weaving. Fine velvets contain forty to fifty rows of loops in an inch length of the fabric, and their production is therefore exceedingly slow and laborious. The process is, moreover, complicated by the use of two shuttles, a stouter thread being used after the wire than the two which succeed. Hence the production of a yard of plain velvet is considered a good day's work.

Various modifications have been introduced in the manufacture of velvet, among which is that of M. Gratrix, who produces the pile by the weft, the cut being then made in the direction of the warp. The pile-threads are woven over a series of fine longitudinal knives, over the points of which the portions of the weft intended to form the pile slide successively as the cloth is woven; and the weft is severed in passing over the cutting portion of these knives, which are fixed. By some of the new methods the velvet is cut and embossed at the same time.

Lyons is the principal seat of the manufacture of broad velvets, such as those for cloak making, called Pouson velvets, and St. Etienne the principal seat of velvet ribbon manufacture. Trimming velvets of the finest kinds are made by hand in Rhenish Prussia.

#### VEN'DACE. See COREGONUS.

**VENDEE**, a department in France, formed out of Lower Poitou and named from the river Vendée, is bounded N. by Loire-Inférieure, N.E. by Maine-et-Loire, E. by Deux-Sèvres, S. by Charente-Inférieure, and W. by the Atlantic. Its greatest length, from north-west to south-east, is 82 miles; its greatest breadth 65 miles. The department comprehends the islands of Bouin, Noirmoutier, and D'Yeu. The area is 2588 square miles, and the population in 1886 was 434,808.

**Coast-line.**—The coast of this department is generally low, and forms, with the islands of Noirmoutier and Ré, the Bay of Bourgneuf on the north-west, and the Bay of Pertuis Breton on the south. The shore is lined with a broad zone of fens, a large portion of which has been re-

claimed by means of dykes and canals, and is of remarkable fertility.

**Soil.**—The interior of the department presents two districts, with very marked distinctions, namely, the *Bocage*, which comprises all the northern part from the Sèvre-Nantaise to the Fens; and the *Plaine*, which includes the southern districts, and bears evidence of having once been submerged by the ocean. The Bocage takes its name from the quantity of timber with which it is clothed; not that there are many large woods, but every field is surrounded by a quickset hedge, in which trees are thickly planted, so that the country has the appearance of a forest. This district is hilly, especially in the east and north-east, where the Gatinais heights cross the department from Deux-Sèvres; the soil is poor; here and there are extensive wastes covered with gorse and broom. The Plaine, which covers about 300 square miles, is the most fertile district in the department; it has a strong clay soil, resting on limestone; sea shells are found on the surface and to a considerable depth below it. Although called the Plaine it presents considerable inequalities of surface.

**Hydrography.**—The department is drained by a great number of small rivers. The Vendée rises in the forest of Chantemerle in Deux-Sèvres, passes Fontenai, and enters the Sèvre-Niortaise above Marans; it is navigable from a little below Fontenai. Its total course is about 46 miles. The Antise, which joins the Sèvre-Niortaise 2 miles above the mouth of the Vendée, is navigable for about 6 miles. The Sèvre-Niortaise is navigable all along the south of the department. The northern and north-eastern parts are drained by the Sèvre-Nantaise and the Boulogne, both tributaries of the LOIRE. The Lay, which, with its affluent, drains the centre and south-west, has been made navigable for about 20 miles above its entrance into the Pertuis Breton. The Vie rises north of Bourbon-Vendée, and enters the Atlantic below St. Gilles, whence it has a tide navigation of about 6 miles. The navigable canal of Luçon has a course of 10 miles from the town of Luçon, into the road of Aignillon, south of which is a remarkable spit of land projecting about 3 miles into the sea.

**Climate and Products.**—The climate varies with the elevation of the soil. The Bocage being hilly has a colder temperature than the rest of the department; the air also is purer, the summer very dry, the winter wet. The summer of the Plaine and the Fens is hotter and longer; the air of the coast is loaded with moist unhealthy vapours. The prevailing winds are the north and the south; the latter is the more frequent. The changes of temperature on the coast are sudden.

The grain crops are more than sufficient for the home consumption, about two-thirds of the entire surface being arable land. Besides wheat, barley, oats, rye, millet, buckwheat, hemp and flax are grown in the Plaine, and to a greater extent in the Fens. The grass-lands are extensive. The horses are small, but vigorous; a great number of mules and asses are bred. The cattle are hardy, but not handsome; many of the fat beasts are sent to the Paris markets. Sheep are numerous, and considerable quantities of wool are produced. The forests are inhabited by wolves, foxes, wild boars, badgers, &c. Small game also abound, and the sea and river fisheries are very productive. The vineyards cover large tracts, and yield a considerable quantity of inferior white wine. The orchards are extensive; the apple, cherry, and chestnut are the principal fruits. The minerals include argentiferous lead, some coal, iron in great abundance, and a few other metals. There are quarries of excellent building and mill stones, and of granite. Clay, some of it fit for porcelain and fine ware, occurs in many places.

The nature of the country peculiarly lent itself to peasant ambushes of the revolutionary wars of the Vendée; but it would be difficult now to realize the ruin and devastations.

tation of the country at that time. Though every mile is almost marked by some tradition of blood or battle, and there is not a house more than sixty years old, it is now flourishing with many industries, Clisson itself being a chief centre of the cloth manufacture. The character of the country and its inhabitants has changed under the system pursued by succeeding governments, and it is now intersected with a network of highroads and railways.

The department is divided into the three arrondissements—La Roche-sur-You, Fontenai, and Les Sables-d'Olonne.

**VENDETTA**, a system of private vengeance by the murder of the evil-doer, which often develops into a hereditary blood-feud between families, is a horrible custom still existing in Corsica, in Sicily, and in Southern Italy. A vendetta may be incurred in a number of different ways. When a man has been slain or a woman seduced, the duty of revenging the act falls upon the nearest male relative, though if he be advanced in years it will probably be undertaken by a younger kinsman. In these cases punishment follows as a matter of course, and no warning need be given. The worst of personal insults is a remark casting direct obloquy on a parent, especially a dead mother. A blow from a master or an acknowledged superior is rarely seriously resented; from an equal it is said that one given with a stick may be forgiven, while one with the hand must be avenged. It is difficult, however, to obtain accurate information as to this and several other points in the code of honour of the vendetta.

As soon as a man feels himself aggrieved he must give fair notice to his enemy; even if he intends to avenge the insult on the spot, he must allow his opponent time to unclasp his knife. Nor is this all. There is a strange courtesy and consideration for others which the chivalrous and honourable Corsicans, and even the hot-blooded Neapolitan beggars, show in the vendetta. Thus a crime of violence is very rarely committed in the house of a friend or in a tavern, as this would cause the host unpleasantness.

A warning of vendetta may be given in so many words; but this is rarely done except in private, as, if the threat were known, the danger of the victor would be increased. The language of signs, so universal in Southern Europe, is generally made use of, and the gesture most commonly employed is made by pressing the thumb and the forefinger together in such a way as to leave a small narrow space between them, which is supposed to typify the hole the challenger hopes to make in his adversary's body. In Naples, too, men still bite their thumbs, as they did in Verona in the days of Sampson and Gregory (see "Romeo and Juliet," the first scene); only in our days this is not an expression of contempt, but a declaration of war.

When the warning has once been given and understood, the claims of honour are satisfied. From thenceforth each opponent is free to guard his own life and attempt that of his adversary as best he can. He may lurk in dark and lonely corners, and stab him in the back without shame. This, which seems to an Englishman the foulest spot in the vendetta, has certainly been spreading of late years, since the vigilance of the police has rendered a fair combat almost impossible, and cunning and secrecy are the only arts by which the victor can hope to escape. In the old days, when an offence was slight, a fair combat with knives which ended in a scratch is said to have been thought satisfactory, though the fiercer kind of vendetta has always existed in the south of Italy, in Sicily, and in Corsica.

From four to five persons are on an average daily found stabbed in the streets of Naples, almost all in consequence of vendetta feuds, and those of the victims who are still living when found, almost without exception declare that they are unable to supply any information with respect to their assailants. The lips of the sufferers are sealed by a sense of honour not more perverse than that which would prevent

any gentleman from reporting the name of an opponent by whom he had been wounded in a duel. Both the vendetta and the duel are unquestionably barbarous and immoral; but to take an unfair advantage in either is base, and this is a baseness of which the lowest of the luzzaroni of Naples, to do him justice, is rarely guilty, even in his death agony. And yet the Neapolitans boast that they are not a revengeful people, which is true if we compare them only with the Corsicans and the Calabrese. They are too light-hearted and also too good-natured to hoard up the memory of an insult as if it were a secret treasure, and to wait and watch patiently for years for an opportunity of wiping it out in blood. Hence family feuds like those of Corsica and of Calabria, which pass from generation to generation, are almost unknown among them. But almost as soon as the traveller southwards passes Salerno, he finds himself among a different race. The forms are taller and sturdier, energy is no longer expended in constant gesticulation; the faces of men and women alike are stern in their aspect. He has entered the country of the true vendetta.

Bad as it is, the vendetta has been shown to be not the wild and reckless vengeance which foreigners usually suppose, but vengeance reduced to rule and recognized by public opinion. And further, in Corsica, and to some extent in Southern Italy also, a similar practice to that prevailing among duellists prevails. For just as the first duty of the seconds in a duel is to endeavour to arrange the dispute between their principals in an amicable manner, and only to allow the duel to proceed on satisfying themselves that no arrangement is possible, so in Corsica the friends of both parties when a vendetta is imminent, seek as *parolanti* (parleyers) to mediate between them in the quarrel, and if they are successful they exact a very stringent oath of reconciliation. It is unknown for such an oath to be broken, but it is very hard oftentimes to get it sworn. The vendetta is the duel of the common people of the countries which are its home; and any peasant or fisherman who shrinks from entering upon one when due cause is given is treated with as much contempt by his equals as a German officer would be if he refused a challenge. This explains a fact that has often puzzled strangers. When a man has been stabbed the sympathy of the populace is almost invariably on the side of the assailant, whom they consider the probable victim of an unjust and cruel law. The act of which he has been guilty is no crime in their eyes. They know that his life would have been rendered intolerable if he had not committed it, and that now the only prospect before him, if he be discovered, is death or a lifelong ignominy. In the old days the brigands were constantly recruited by men who had had such a "misfortune," and who fled to the mountains to escape the galleys. So long as this feeling persists so long will every effort fail in ridding Corsica and Italy of this pernicious custom. When the vendetta has become ridiculous, as the duel has become in England and is becoming in France, then only it will die.

The origin of the vendetta is remote. It must be rather looked at as a survival than as a local development. Where the customs of savages are accurately known it is found that a system of blood-feud always prevails; so that the anthropologist regards this punishment by private vengeance as the usual custom of uncivilized man, and the punishment by law as the civilized substitute for it. The Australian tribes have extremely fierce blood-feuds, for example; and if we advance even to comparatively civilized nations which still retain nomadic habits, such as the hordes of Central Asia, the Bedouin Arabs, or even the Circassians, and the Druses, we find vendetta fiercer than that of Corsica. It is scarcely necessary to do more than simply refer to the many cases of private vengeance found in the earlier history of the Hebrews, at a time when they were at about this stage, or a little more advanced—for the pages of the Bible are familiar to most persons.



Passing onwards to the civilization of the simplest settled kind, we see the Teutonic tribes, who developed into this state when they possessed themselves of the ruined Roman Empire, instituting a complicated code governing private war, and this lasted for centuries as a privilege of men of noble birth, the vassals being implicated with their lords on each side. It was with the greatest difficulty that this custom was stamped out in fully civilized states, only finally disappearing when the modern age began, about 1500. It is in long ill-governed or lawless places, and chiefly in mountainous regions, such as Corsica, Sardinia, Calabria and Sicily, Montenegro and Albania, Circassia and the Lebanon, that this once universal privilege of a proud nobility survives in the degraded form of a local custom of the ignorant peasantry.

**VENDOME**, a town of France, in the department of Loir-et-Cher, situated on the Loir River, 19 miles north-west of Blois. It had 8520 inhabitants in 1886, and manufactures of gloves, cotton goods, hosiery, &c. There are some curious remains of Norman architecture and some picturesque ruins of a castle. Near it are the remains of a Gallo-Roman theatre. The town was the scene of some of the operations of the Franco-German War. But it is most remarkable for the Boy Crusades, which originated here, 1262, with a shepherd youth, Stephen. About 10,000 children were encouraged by their infatuated parents and the priesthood to follow him to Marseilles, to embark for the Holy Land. After suffering great hardships on the way to this port, the survivors were trapped on board ships for Alexandria, and sold there as slaves.

**VENDOR AND PURCHASER.** Contracts for the sale and purchase of land or other real estate may be entered into either privately between the parties or upon a sale by auction. At common law agreements for the purchase of real estates might be made by parole, but by the Statute of Frauds (29 Car. II. c. 3, ss. 1, 2, 3, and 4), "All leases, estates, interests of freeholds, or terms of years, or any uncertain interest of, in, or out of any messuages, manors, lands, tenements, or hereditaments, made and created by livery and seisin only, or by parole only, and not put in writing by the parties so making or creating the same, or their agents thereunto lawfully authorized by writing, shall have the effect of leases or estates at will, any consideration for making any such parole leases or estates notwithstanding." But leases not exceeding three years, whereupon the rent reserved should amount to two-thirds of the full improved value were excepted.

Upon sales of estates by public auction, the highest bidder, upon being declared the purchaser, is considered to have entered into a contract for purchase according to the particulars and subject to the conditions of sale; and the auctioneer, who is for this purpose considered as the agent of both vendor and purchaser, is thereupon authorized to sign an agreement of purchase. The writing down the purchaser's name upon any memorandum of sale at the time of the bidding is a sufficient signing.

The Statute of Frauds does not extend to Scotland. There, at common law, writing is essential to all sales of heritages, and also of leases of land or contracts of service for a term exceeding one year.

**VENEER-ING** is the art of laying thin leaves, called *veneers*, of a valuable kind of timber upon a ground or foundation of inferior material, so as to produce articles of elegant appearance at smaller cost than if they were composed entirely of the ornamental wood, and also with the view of using for furniture woods with such curiously contorted fibres that any boards cut from them would never stand perfectly true—while veneers can be affixed to a wood of straight grain, and thus serve every purpose. Veneers are cut by thin saws or knives worked by machinery, and then glued down to the substratum (which

should be of dry straight-grained wood) with strong glue. Precautions are taken to prevent the veneer from springing or loosening before the glue is dry. The work is afterwards finished with very fine planes and scrapers, and then usually French-polished.

Before sawmills were made applicable for this purpose the elder Brunel devised a mode of cutting timber into veneers by a kind of knife, which answered well for straight-grained and pliant woods, such as Honduras mahogany, and is still in great use. The veneers are, however, inferior to the stouter and much costlier saw-cut veneers.

Ivory veneers, or rather thin sheets for miniatures and for memorandum books, are sometimes not more than one-sixtieth of an inch in thickness, requiring much nicety in their manipulation; and wood veneers as thin as paper are frequently produced under the knife.

Veneering of a remarkable kind, under the name of *pressed work*, is often used. Instead of a thin veneer being placed upon a thicker substratum, the whole substance consists of veneer. It comprises four, six, eight, or any other number of layers. Some strong plain wood, such as black walnut, is selected for the interior layers, and rosewood or other fancy wood for the exterior. The veneers, of the usual thickness, are well saturated with glue, and placed one upon another, with the grain of each layer at right angles to that of the next. The mass, while hot, is placed in the usual veneering moulds, named *cauls*, and pressed forcibly for twenty-four hours. When taken out the wood is found to be firm, elastic, and strong, and to conform to any curvature which the mould may have given to it. On account of the crossing of the fibres it can scarcely split, except by a force that would rend it to pieces, and the pores have become so filled with glue as to add in a remarkable way to the strength of the substance. Chairs, the framework for bedsteads, and even the bodies of musical instruments are made in this way, and are in great demand for their strength and singular lightness.

**VENERIDÆ** is a family of molluscs belonging to the class LAMELLIBRANCHIATA, order Siphoniata. This extensive family is remarkable for the elegant form and varied colours of the shells of many of the species which belong to it. The animals have a large, compressed, tongue-shaped foot, by means of which they crawl, and short unequal retractile siphons, united sometimes for a considerable portion of their length. The mantle has a large opening in front. The shell is regular, closed, or sometimes slightly gaping, and more or less circular or oval in shape. The hinge has usually three diverging cardinal teeth in each valve, and the hinder lateral tooth, when present, is compressed, and forms a part of the margin of the shell; the ligament is external. The muscular impressions are smooth and polished, and the pallial line is sinuated. The animals of this family are all marine, free, and possess considerable locomotive powers, a few only burrowing in or perforating rocks. They are found in all parts of the world, but most abundantly in the tropics, and date from the Oolitic period. Some of them are eaten by man in different parts of the world, and are even esteemed a delicacy. The Venus shell appears to have been held in honour by the ancients, and was dedicated to the goddess of love. Of the typical genus *Venus* nearly 200 species are known, widely distributed throughout the world, and ranging from low water to 140 fathoms. They are all edible. One species, *Venus mercenaria*, was used as money (wampum) by the North American Indians, who perforated the sea-worn fragments of the shells and strung them on leather thongs. Other genera are *Cytherea*, *Artemis*, *Tapes*, *Venerupis*.

**VENESECTION.** See BLEEDING.

**VENETIA**, the most north-easterly division of Italy, comprehended between the lower courses of the Po, the Adriatic, and the Alps, and comprising the provinces of

Belluno, Padua, Rovigo, Treviso, Udine, Venice, Verona, Vicenza. It has an area of 9,059 square miles and a population of 2,814,173. The country is a vast plain except in the north and north-west, where it is covered with offsets from the Carnic Alps. The chief rivers beside the Po, are the Adige, Brenta, Piave, and Tagliamento, all flowing to the Adriatic and the Mincio, a tributary of the Po, flowing from Lake Garda and forming the boundary with Lombardy. The soil in the plain is rich, producing corn, rice, fruits, flax, hemp, &c., and is carefully cultivated.

**VENETIAN ARCHITECTURE** has three phases, each of them especially remarkable—the Byzantine, the Gothic, and the Renaissance.

**BYZANTINE ARCHITECTURE** has been described in the article of that name, and as therein appeared, the building in this style next in importance to the peerless Santa

Sophia herself is the glorious Cathedral of St. Mark's at Venice. But upon the Byzantine basis there is in St. Mark's a large admixture of Saracenic elements, the great traffic of Venice with the East familiarizing her with the noble architectural productions of the Arab races. Later work added also much that is Gothic to the cathedral, and of course still later the Renaissance architects somewhat mauled it. In the main, however, with its five semicircular domes (the external domes of Saracenic outline are mere coverings), its equal-armed cruciform plan, its semicircular windows, its triple apse and barrel-vaulted aisles, its mosaics, and its lavish use of gold backgrounds for the numerous pictures and designs which enrich its walls, St. Mark's remains firmly Byzantine, and is perhaps the most glorious building of the style. The body of St. Mark, dug up by the sultan, who destroyed the church at Alexandria, wishing;



Palazzo Cavalli.

View of the Grand Canal.

Dogana. S. M. della Salute.

to build a new palace, was secured by Christians and brought to Venice in triumph in 829.

**GOthic ARCHITECTURE** has also been elsewhere treated; but Venetian Gothic, like Byzantine Gothic, is almost a style in itself. The Byzantine element continued to show itself after the rise of Gothic, and as at the same time the Saracenic element largely developed, they united to modify the pointed architecture of the north into one of the most fascinating and peculiar combinations ever attained. It is especially of the Gothic buildings in Venice, those dating from 1200 to 1400, that one thinks when longing for a sight of that marvel of the world; it is of the Doge's Palace, the most daring architectural conception existing, of the Cà d'Orto, of the Cavalli, &c., and not of Sansovino's Library or the Palladian Maria della Salute, beautiful as these are. These wonderful old palaces along the Grand Canal and elsewhere are so infinitely varied that it is the work of a life-

time to classify them. The inventiveness of the architects seems to have been exhaustless. Ruskin's "Stones of Venice," large work as it is, scarcely does more than indicate the large field of Venetian Gothic architecture, and his beautiful collection of "Examples of the Architecture of Venice," published in 1887, only serves to show to those who have had the happiness to see this exquisitely beautiful city how much they have missed. It is only a great master like Ruskin, working continually for long periods himself, and employing a staff of skilled artists to work for him, who can worthily set forth some few of the multitudes of fine architectural forms which go to make up the loveliness of the Queen of the Adriatic. In such works as these, those who know Venice see how little they really know; how corners often passed by contain un hoped-for gems of art, how details of well-known buildings take on a marvellous beauty never seen before when examined, as it were,



microscopically, and how in this way general feelings of admiration give place to special memories, which remain an everlasting source of the purest pleasure art can afford.

Some few features of Venetian Gothic can at least be mentioned as common to nearly all these beautiful palaces amidst their large variety. (1) The form of the windows, which, instead of the usual Gothic smooth-curved arch, more often take a curve of contrary flexure, an ogival outline, of quite a Saracenic aspect, and very frequently bear cusps like church-windows, at once strike the observer. The angle-windows and balconies are also very remarkable for their grace and variety. The finest windows, moreover, have pillars on each side, standing on the window-sill, and supporting the external moulding of the window arch, as a pillar supports the arch of a church nave, the moulding of the window arch finishing on the wall in a pretty finial above, and the whole window opening being inclosed in a rectangular panel, richly moulded, usually with an alternating dogtooth ornament of a variety peculiar to Venice. (2) The lower storeys of the palaces, and sometimes the upper storeys too, have shafted windows like those just spoken of, with balconies in front, and finishing above not by a finial on a closed wall, but by a beautiful pierced design, often a quatrefoil, in a circle, with smaller trefoil piercings to fill out both the spandrels of the window arch and the corners of the panel inclosing the whole window. (3) In typical palaces the middle third of the front contains a linked set of such windows on the first and the second floor, the shafts becoming pillars of an open arcade, the quatrefoils running together into a glorious series, and the whole opening corresponding to the large halls which were necessary in the interior of the building, external feature corresponding, as in all true architecture it must do, to internal function. Right and left of this most splendid centre the walls are comparatively solid, the windows of the first and second classes above-named piercing them at rather large intervals, and therefore permitting their comparatively plain surfaces at once to denote the solidity of the building, and to throw up by contrast the exquisite lightness of the central part. The Cà d'Oro is peculiar because of the centre and the right wing alone being finished, giving it, lovely as it is, a curious one-sided look. We have selected the Cà d'Oro as the subject for a Plate to illustrate this part of the article, but the reader must mentally extend the building to the left to realize the architect's design. In the preceding woodcut of the seaward end of the Grand Canal the Palazzo Cavalli, to the extreme left, gives an excellent example of the entire design of a typical palace in Venetian Gothic, except that the reader must sweep away the absurd garret-like addition on the roof which at present destroys the Cavalli. Its next-door neighbour shows the true straight cornice of the style. Close at the right side of the Cavalli "garret" is seen one of the trumpet-shaped chimney mouths spoken of below. The Doge's Palace has the usual solid wall all along the upper storeys, the whole of the ground-floor and first storey being made up of the splendid traceried arcades we have attempted to describe. The fairy-like lightness of these arcades is scarcely representable in sober language, but when examined they are seen to be in reality very solid, and well able to bear the great weight they night and day so easily sustain. Their effect is largely due to contrast.

At the corners of the palaces, the Cà d'Oro (see Plate) being an example, a lovely effect is given by the introduction of a pillar, usually beautifully twisted in a sort of inversion of a cable twist—one of the happiest devices in the whole of architecture. Then the narrow yet rich cornices and bands which mark the horizontal divisions of the structure, with here and there an occasional Saracenic battlement; the fine bold doorways and the marble door-steps necessary to rise above the watery high-road; the unusual chimneys, rising well above the roofs and spreading

out like a trumpet at their tops; the panels of coloured marbles let in flat to the face of the building, or polished bosses rising from a circular moulding—these and other charms are peculiar to Venetian Gothic, and are usually to be found in every principal building in various proportions. Thus the Doge's Palace is panelled all over with diamonds of alternate rose-coloured and of white marble, the latter having now developed a charmingly delicate cream-tint from age. The effect is beyond description exquisite. But how much enhanced would not the effect be if we could restore once again those tiers of long marble steps once surrounding the entire palace, and now covered over by an "inundation of paving-stones," as it has been wittily called, due to successive raisings of the Piazzetta.

RENAISSANCE ARCHITECTURE.—This, too, is dealt with in its own place; but, as in the other divisions, here also we find a quite peculiar charm in Venetian Renaissance. It sprang into growth at the end of the fifteenth century, and lasted till the end of the sixteenth, out rivaling Rome in splendour, except for the genius of Michelangelo alone. If ever one is to admire the Renaissance, it is to Venice that one must go. The earliest successes were made in a most remarkable transitional style of great beauty, combining Gothic and classic elements as charmingly as our own Elizabethan style, but in a quite different and more imposing manner. Pietro Lombardo produced the Vendramin Palace at this time (1401). The Cornaro and Trevisano palaces are other fine examples. Most of them have round-headed window-openings, with smaller round-headed windows with the large opening, and the centralized specially Venetian effect of the openings is still retained. The internal courtyard of the Doge's Palace is also a remarkable example of this transition period. The more purely classic Scuola di San Rocco closely followed it; and then San Michele, in the first half of the sixteenth century, in the Grimani Palace (1550), &c., passed into the pure Renaissance style—abandoning, to the regret of some, the fertility of Gothic invention, but yet never descending to that cold frigid pictorial style which so many of the Roman architects delighted in. The great Sansovino, at all events so far as regards decorative effects, surpassed his predecessor in this style, and the Library in the great square, and other buildings by him at Venice, mark the finest point ever reached in Renaissance architecture, if we except one building alone—the unequalled masterpiece of Michelangelo—St Peter's at Rome.

Following Sansovino came the man who forged the fetters of Renaissance classicism, the famous Palladio (1510-80). So accurately did he map out the whole domain of Renaissance architecture that he gave it a name, and it is as often called "Palladian" as it is "classical." His influence surpassed that of Michelangelo, though his genius was so infinitely less. Now arose the classical porticos, the great orders of columns, all the frigidities which in less great hands have ended by so completely wearying us. The Church of the Redentore on the Giudecca is a good example of Palladio; and the Church of the Salute, nearly opposite the Piazzetta, is by his pupil Longhena (1632). This famous shrine of Our Lady of the Salvation is seen on the right of the cut illustrating this article, but the scale is too small to show the merit of the design. Beyond it, seaward, is the little *dogana* (*douane*, custom-house), which marks the end of the canal and the beginning of the open sea. Through the opening and away out at sea is the low coast of the *Lido*, the long natural breakwater, outside which the Adriatic waves beat, but inside which are the smooth shallows of the lagoons. The posts which rise from the canal in front of the palaces are for the gondoliers to hold on to with their boathooks when taking up or setting down visitors. Palladio's ground-plans are really most carefully and successfully thought out, and even if one cannot sympathize with the style in which he designed, one must admit

him to be a perfect master of it. The essential falsity of the style is, however, apparent from the fact that the façade has usually very little relation to the real interior arrangement of the building.

Thus did this wonderful city, in her days of splendour and vitality, adapt and specialize to her own use styles general elsewhere. The centralized façade, for example, so fine a feature in the best Venetian palaces, was a necessity both internally and externally, for as every inch of ground had to be won from the water, projections were not to be thought of, and the problem of relief had to be solved on a flat wall surface. It is this which one feels consciously or unconsciously in all but the later Palladian architecture of Venice, and which makes the city so lovable; every feature one sees has its real meaning, architecture is a living thing, expressing true thought and ideals in stone, and not copying the bygone thoughts and ideals of other men and of other climes.

**VENETIAN CHALK**, a white talc or soapstone, similar to the kindred variety called *French chalk*, used for marking cloth, for manufacturing drawing crayons, &c.

**VENETIAN RED**, sometimes called *Scarlet Ochre*, a very useful pigment in oil and water-colour painting. It is a burnt ochreous earth, of a fine-toned red, usually alloyed with blue and yellow.

**VENETIAN SCHOOL OF PAINTING.** The historians of Venetian art date the commencement of modern painting in Venice from the eleventh century, or about 1070, when the Doge Selvio invited some Greek mosaic-workers to Venice to adorn the Church of St. Mark; and in the thirteenth century, after the capture of Constantinople by the Venetians, in 1204, not only works of art, but artists also, Venetians as well as Greeks, are said to have been plentiful in the island city. Only two, however, of the former can now be named, Giovanni da Venezia and Martinello da Murano. Of course, all art was in the debased Byzantine style at this period at Venice, as elsewhere.

In the fifteenth century a very different style began to prevail; and although the artists of this period still designed with great stiffness and in the Byzantine taste, they produced many admirably-coloured pictures as regards the brilliancy and composition of colour, while in the local colours and reflexes they were yet deficient. The leaders of the improved style were some painters of the small island of Murano, and it has the glory of having been the nursery of the greatest Venetian masters: for example, Titian studied at Murano. The first painters of this place were Quirico, Bernardino, and Andrea da Murano; but its great ornaments were the Vivarini. The principal contemporaries and rivals of the latter in Venice were Jacopo Nerito of Padua and Nascerchio di Bassano the elder, both scholars of Gentile da Fabriano, who was employed in Venice at the beginning of the fifteenth century; also Jacopo Bellini, Francesco del Fiore and his son Jacobello del Fiore, and Morazone; and Donato and Carlo Crivelli, scholars of Jacobello del Fiore.

Besides the painters already mentioned, there were others of equal merit in other parts of the state, as in Bergamo and Brescia. The greatest master, however, of this period was Francesco Squarcione of Padua, who formed there the most illustrious school of painters ever brought together by one man. Only a single still existent work at Padua is positively known to have been done by Squarcione, and it was painted for the Lazara family in 1452; it is excellent in colouring, in expression, and in perspective. Mantegna, Marco Zoppo, and Jacopo Bellini were his scholars.

About 1470 a great change took place in the Venetian method of colouring. The old methods of painting in distemper (*tempera*), and with gums, &c. (*à guazzo*), were laid aside for what is now generally called oil painting, which was introduced into Venice by Antonello da Messina,

who, according to the tradition, had learned it in Flanders of John van Eyck. Roger of Bruges, another scholar of Van Eyck, is said to have visited Venice. The first Venetians who distinguished themselves in the new method were the Vivarini and the Bellini. Giovanni Bellini acquired the reputation of being the most distinguished painter of his time; he flourished from 1464 until 1516. His superb portrait of the Doge Loredano in our National Gallery shows how magnificently he could work. The intense spirituality of his expression, his truth to nature, and the brilliancy of his colouring marked a point beyond anything heretofore attained. Gentile Bellini, youngest brother and collaborator of Giovanni, was also an admirable artist. Great as Giovanni Bellini is in himself, he is still more remarkable as a teacher. No man ever had such a crowd of fine scholars, all reflecting on their glowing canvases that proud magnificence which is the note of Venice in her prime.

Under the influence of the Bellini, Venice sprang at once to the rank of a principal centre of art. But two of Bellini's pupils are so pre-eminent as to have thrown the others into comparative oblivion. As with Shakespeare in the Elizabethan drama, whose contemporaries are dwarfed by his colossal stature, so with Titian (1477-1576) and Giorgione (1476-1576) among the pupils of Bellini. It is in the works of these two extraordinary masters that we must look for the highest point of the Venetian school. It is true that they cultivate the sensuous rather than the intellectual, the pictorial rather than the moral, but their faithfulness to nature, their accurate study of light and reflection, their marvellous reproduction of flesh-tones, and their perfect rendering of texture of all descriptions have never been surpassed, and in some qualities have never been equalled in the whole world of art. The genuine Giorgiones are almost to be counted on the fingers, so fearful has been the havoc of time—but these are among the masterpieces of the world. It is questionable if he was ever excelled. His best pupil, Sebastiano del Piombo (1485-1547) worked also under Michelangelo, and his masterpiece (which we fortunately possess in the National Gallery), "The Raising of Lazarus," is usually held to have actual work of the great Florentine in it. As for Giorgione's fellow-pupil, as great as he (or, in the eyes of many, greater), and far more versatile—the immortal Titian—it is happily unnecessary to do more than mention his name. Everyone knows his superb excellence—beyond criticism, beyond praise. There are numbers of persons who think the "Assumption" at Venice the finest picture in the world, though Raffaele's Dresden "Madonna di San Sisto" would no doubt receive the vast majority of votes. The destruction of the "St. Peter Martyr" in SS. Giovanni e Paolo, by fire in 1867, was regarded as a loss of one of the world's treasures. Raffaele away, probably Titian would receive the popular verdict as the greatest of painters. That he is the greatest portrait painter of all time is probably universally admitted among true critics; he unites the minute fidelity of the Dutch school itself with a power to delineate character no Dutchman ever possessed.

Followers of Giorgione and Titian (but not actually their pupils) were Palma Vecchio, i.e. the Elder (1480-1528); Paris Bordone (1500-71), a very fine work of whom we fortunately possess; Giovanni Antonio Licinio, commonly called Pordenone (1483-1539), almost rivaling Titian himself in the painting of flesh; Alessandro Bonvicino (1498-1555), commonly called Il Moretto, a native of Brescia; Giovanni Battista Moroni (1510-78), a pupil of Bonvicino, and a simply marvellous portrait painter, whose best works are in the National Gallery, and would be dangerous rivals to Titian's if they did not lack his magical glow and richness; Romanino of Brescia, Bonifazio of Verona, and Bonifazio of Venice, all of whom are now known to be authors of works long attributed to Giorgione or Titian; and others.

Contemporary with the latter of these painters were two who form the afterglow to the splendour of Titian and Giorgione—these are Jacopo Robusti of Venice, commonly called Tintoretto (1518–94), and Paolo Caliari of Verona, commonly called Paolo Veronese. Tintoretto actually studied under Titian, and endeavoured to unite to his master's grand colour the equally unrivalled form of Michelangelo. His frescos in the *Scenola di San Rocco* at Venice are most remarkable, and his splendid canvas of the "Miracle of St. Mark and the Slave" in the Academy of Venice divides attention with his master's "Assumption." Of Paolo Veronese we have a fine example or two in the National Gallery, though his masterpieces are undoubtedly the magnificent "Marriage at Cana" in the Louvre. With these two great masters, we must also mention Jacopo da Ponte, called Il Bassano (1510–92), who, with several members of his family, painted admirably in the best Venetian manner of the grand period.

After the time of the great masters just spoken of, in the seventeenth century, the Venetian school of painting declined as much and as rapidly as the Florentine did after the death of Michelangelo. Many of the Venetians of this period, apparently mistaking brilliancy for art, cultivated little besides colour, and many of their pictures are mere compositions of silks, satins, and other stuffs. Jacopo Palma Giovane, *i.e.* the younger (1544–1628), holds a middle place between the great painters of the last period and the mannerists of this. Lanzi calls him the last of the good age and the first of the bad. In 1630 and 1631 many painters were carried off by the plague, which visited Venice in those years; and traces of the excellencies of the great masters were after that time still more rare in the works of the surviving Venetian painters. In the middle of the seventeenth century the style of Caravaggio and the Naturalisti began to prevail there, and several foreigners supplanted the national painters in public estimation in Venice itself. Of these Naturalisti and Tenebrosi, Pietro Ricchi of Lucca, called Il Lucchese, was one of the best.

At the end of the seventeenth century no particular style prevailed in Venice, and all the various classes of painting had their votaries: landscape, architecture, battle, and marine painters were alike numerous. Gianbattista Tiepolo (1693–1770), who often painted the figures in Canaletto's landscapes, was the last of the Venetians who in the seventeenth century acquired a great name.

Quite in the decay of Venetian art arose an architectural painter whose accurate drawing and almost photographic clearness of delineation fortunately reproduce Venice for us as she really existed 150 years ago. Though his cold colour and absence of poetry prevent us from being roused to enthusiasm, he has always been a favourite with Englishmen. This was Antonio Canal, commonly called Canaletto (1697–1768), to a visit of whom to England we owe the good fortune to possess several excellent works by this master. The National Gallery has ten of the best of them. An imitator of Canaletto's style, *longo intervallo*, was Francesco Guardi (1712–98), also represented at his best, such as it is, in the National Gallery. With his dry, uninteresting canvases, the great school of Venice sinks beneath notice.

**VENEZIA'NO, DOMENICO**, an Italian painter, born at Venice about 1410, who was taught oil-painting, then quite a new art, by Antonello da Messina about 1450. About ten years afterwards Domenico Veneziano was employed at Florence, together with Andrea del Castagno, to execute some paintings in the Portinari chapel in the Church of Santa Maria Nuova; and the tale goes that Domenico communicated the secret of his method to Andrea, who in reward treacherously murdered him about the year 1463. Scarcely a trace of Domenico's work now remains.

**VENEZOLA'NO**, the unit of value and account in Venezuela. The gold Venezolano, sometimes also called

*Bolivar* incorrectly, weighs 1·613 gramme, 900 fine, and is therefore worth about 5 francs, or more exactly *3s. 11½d.* Pieces of 20, 10, 5, and 1 are struck. The silver Venezolano is exactly equal to the French 5-franc piece, and is thus exchangeable very conveniently for money of most continental nations. The *Bolivar*, sometimes used as an equivalent term to the Venezolano, is in reality one-fifth of a Venezolano, *i.e.* equal to one franc. As mistakes had been made, the Venezuelan consul in London expressly notified this in 1881.

**VENEZUE'LA**, a republic in the N.E. of South America, is bounded N. by the Caribbean Sea, W. by the United States of Colombia (New Granada), S. by Brazil, and E. by British Guiana and the Atlantic. The area is 439,120 square miles; and the population, according to estimates made in 1884, is 2,120,000. The name Venezuela means "Little Venice," and the country was so called by the Spaniards in 1499, when they discovered a native village near Lake Maracaibo built on piles (in order to avoid inundations), which gave it the appearance of a miniature Venice.

*Sea-coast and Islands.*—The Boca de Navios, or principal mouth of the river Orinoco, is the most eastern point of the sea-coast of Venezuela. From thence the shore extends W.N.W. to the innermost recess of the Gulf of Paria, a distance rather exceeding 200 miles. The whole of this tract is very low, and a part of it is covered by the sea at high water. The Peninsula of Paria, which divides the gulf from the Caribbean Sea, is occupied by a ridge of high rocks. Another rocky peninsula extends westward as far as the town of Cumana, between which and Barcelona, about 72 miles, the coast is of moderate elevation. From Barcelona to Cape Codera, a distance of about 128 miles, the shore is low and sandy; but between Cape Codera and Puerto Cabello, about 155 miles, it is very high. From Puerto Cabello to La Vela de Coro it is 165 miles, generally low and sandy. Further west, to the limits of Venezuela, the shores are mostly low, sandy, and in some places covered with swamps or lagoons. The whole coast-line of the republic extends about 1580 miles.

The chief harbours are those of Cumana, at the south side of the Gulf of Carinco, capacious enough to receive and shelter all the fleets of Europe; and Puerto Cabello, which is also roomy and secure.

Within the jurisdiction of Venezuela are numerous islands, both large and small, on the northern coast, in the Caribbean Sea. The chief of these is Margarita, which constitutes a province in itself, and is 40 miles long by 20 wide. The others, mostly uninhabited, are the resort of innumerable sea-fowl. Some of them contain valuable deposits of guano of excellent quality.

*Surface and Soil.*—Venezuela contains three distinct mountain regions, extending respectively over the north-west, the north-east, and the south-east. The north-west parts are occupied by the Andes and the mountains of the coast, which are connected with the Andes; the north-east districts are mostly covered by the ranges of the Sierra de Bergantin; and the south-east region comprehends the western portion of the Sierra de Parima. These mountain ranges are separated from one another by plains. The former occupy about 90,000 square miles, while the latter extend over about 310,000 square miles.

The chain of the Andes is a continuation of the most northern portion of the Eastern Andes of New Granada, before leaving which it divides into two branches—the east and the west. The former enters Venezuela on the south, and stretches north-east for more than 300 miles. It forms an enormous mass of rocks, occupying with its declivities a mean width of more than 60 miles; and the highest portion is generally a narrow table-land, so elevated that no trees or bushes are found on it, but only a few hardy alpine plants. These table-lands, called *paramos*, are from 10,000 to 12,000 feet above the sea-level,

and there are several summits above 14,000 feet high. The loftiest peak in the Nevado de Merida is 15,800 feet above the sea, and is always covered with snow. Where cultivation has been attempted on the slopes of these mountains it succeeds to a height of 8000 or 9000 feet—the line which separates the cereal crops of temperate climates (wheat, barley, &c.) from tropical productions (maize, coffee, the yuca, &c.), being at an elevation of about 4000 feet. The west branch of the Andes runs into Venezuela much further north, and extends to the coast at Cape Chichibacoa. It has but a moderate elevation, rarely exceeding 4000 feet, and is nowhere cultivated. The thick forests which cover it in its whole extent shelter the independent Indian tribes, the Cucinas and the Goajiras. Between these two ranges lies the basin of the Lake of Maracaibo. This lake, the largest in South America, is 92 miles long, and the channel by which it is connected with the Caribbean Sea is 46 miles, so that it really extends 138 miles from south to north. Its greatest width is 82 miles.

The Coast Range (Sierra Costanera) begins where the Andes terminate on the left bank of the Cojedes, an affluent of the Portuguesa. The mountains themselves do not constitute a large mass of rocks, but divide into several ridges, and their elevation sinks to nearly half the height of those south of the Cojedes, though the Silla de Caracas rises to 8600 feet, and forms a conspicuous object from the sea. Between this high ground and the sea on the north spreads a tolerably level tract, several miles wide, but on the east along the shores of the Golfo Triste the hills come close up to the water at several places. The eastern portion of the Coast Range is composed of two well-marked ridges, and of one which is frequently interrupted. The country inclosed by the two parallel ridges contains the Lake of Tacarigua, which extends from west to east about 30 miles, and 13 from north to south in the widest part. It has no outlet; and being inclosed by mountains, presents the most diversified and beautiful scenery. The north shores are very fertile; but on the south is a desert.

The mountain region called Sierra del Bergantin, which occupies the north-eastern portion of the republic, and is sometimes considered as an offshoot of the Coast Range, is of comparatively small extent. Its length is about 180 miles, and its width varies between 50 and 10 miles. The valleys and table-lands of these heights near the coast are the chief seats of cultivation in Venezuela, and form the most populous region of the torrid zone in the New World.

South of the mountain regions hitherto mentioned are the *llanos* or plains, which lie between the Orinoco and the Andes, and cover an area estimated at above 150,000 square miles. This tract, though one immense plain, presents a great variety of elevation, climate, rivers, and productive powers. Some districts are hardly elevated above the sea, while others rise to nearly 1300 feet: some are arid deserts, while the vegetation of others is extremely vigorous nearly all through the year. The whole, however, is characterized by a want of forests. Further west lie the table-lands or *mesas*, which constitute a peculiar feature in this part of the country. The surface is quite level: the soil, consisting chiefly of sand, is unproductive, and the rains do not fertilize the ground, but give origin to a hundred rivers, running south to the Orinoco, east to the Gulf of Paria, and north to the Caribbean Sea. The country between the table-land and the Caribbean Sea extends about 60 miles from north to south, and is a level plain, fit only for pasture. The plains of Barinas are considered the most fertile part, and the best adapted for cultivation. These extend along the base of the Andes from the Rio Portuguesa to the Rio Sarare and Apure, a distance of more than 150 miles, and are from 60 to 80 miles wide. Between the Rio Apure and the Rio Meta,

both affluents of the Orinoco from the west, are the *llanos* of Apure, the lowest portion of the great plains.

South of the Rio Meta begins a woody region, which extends southward to the limits of Brazil, and may be considered as the northern portion of that immense forest which occupies South America on both sides of the equator. It is very imperfectly known, except along the banks of the Orinoco.

In the southern part of the republic, on the frontiers of Guiana, and between the Orinoco and the Amazon, rises an insulated group, called collectively the mountains of Parima, which are divisible into several chains, and extend for the most part east and west. This extensive region still remains unexplored—a wilderness overgrown with superb forests. It is known, however, that the hills nowhere attain the elevation of the *paramos*, so that their summits, if cleared of trees, would be capable of yielding the grains of Europe. The interior has been traversed only by a few adventurers, who have followed the course of the large rivers in search of the famous El Dorado. This was the object for which the expedition of 1595 was sent from England under Sir Walter Raleigh.

*Rivers, &c.*—Venezuela is almost everywhere well watered. Its principal river is the Orinoco, into which flow about 400 tributaries, many of them navigable. The Orinoco itself holds the third rank among the great rivers of South America, and the exuberantly fertile valley of this noble stream, which, with its affluents, waters a territory of 150,000 square miles, offers all the natural conditions of an opulent and populous state. The rivers, which have a course of at least 100 miles within the limits of the republic, are about sixty in number. The greater part of them join the Orinoco. The southern portion of Venezuela is drained by the Rio Negro, which in its upper course is called Guainia. It is joined from the north by the Casiquiare, a branch of the Orinoco, connecting that river with the Amazon. This natural channel is 248 miles long, in general 30 feet deep, and on the average about 400 yards wide. The rivers which fall into the Caribbean Sea without joining the Orinoco, Rio Negro, or Essequibo, have a comparatively short course. The Guaraupiche rises in the mountain system of the Bergantin, and falls into the Gulf of Paria. It runs about 180 miles, of which more than 70 are navigable. The Neveri rises in Mount Turumiquire, runs about 60 miles, and is navigable for small boats for 40 miles. The Unare, rising in the *mesas*, flows about 170 miles, and is navigable for 90. The Tui, which drains the principal valley of the coast range, is navigable for more than 80 miles, its total length being 190. The Tocuyo rises on the northern declivity of the *paramos* of Niguitao and of Rosas, and falls into the Golfo Triste after a course of 330 miles, of which more than 150 are navigable. Venezuela contains about 200 lakes or lagoons, but most of these are the results of inundation, being only marshes more or less permanently covered. Only two of the whole number—those of Maracaibo and Tacarigua—are deserving of notice for their extent or beauty.

*Climate and Productions.*—The climate of Venezuela exhibits in the highest degree the equatorial character, and earthquakes are frequent. The change of seasons is scarcely perceptible, and vegetation goes on perpetually. On the coast the thermometer ranges from 80° to 90° Fahr. all the year round; but notwithstanding this continuous heat epidemic diseases are rare. Only two peaks in Venezuela are above the line of perpetual snow. Here, as in other countries between the tropics, the year is divided into the wet season and the dry season.

The articles of cultivation grown for exportation are cotton, indigo, cocoa, coffee, sugar, tobacco, and cocoa-nuts. The cultivation of indigo has much revived since 1871, but the once highly-esteemed Caracas cocoa has been

deteriorated through the introduction of Trinidad seed. The cocoa-nut is very generally grown along the coasts, and is very remunerative in suitable situations. The tobacco is of the best quality, and includes the well-known Varinas, so much esteemed in Europe. Wheat is produced only in the more elevated tracts; but maize is extensively cultivated all over the country, and near the coast it is gathered in about four months, so that two crops of it are easily obtained in the year. Millet is also raised, and rice is grown in a few places in the lower tracts. Barley succeeds only on the declivity of the Andes. The plantain supplies the staple food of the great majority of the population. The yuca is cultivated chiefly by the Indians, who prepare from the roots the farinaceous meal called manioc. Among the large timber the mahogany, satin and rose woods, ebony, and many varieties of palms are the most important. Sarsaparilla, dragon's-blood, copaiba, and other drugs, besides *caucho* or caoutchouc from several trees of different kinds, are all produced in this country. There are large forests of the cinchona or Peruvian bark tree; and vegetables are raised in great variety. The cow-tree is so named from its yielding a pleasant milk when pierced.

The domestic animals constitute one of the principal branches of the wealth of Venezuela. The large plains supply pasture for cattle, horses, mules, and asses, and the number of these is very great. Sheep and goats are also generally kept, but are only numerous in one or two districts. Pigs abound in the valleys of the mountain ranges and the countries contiguous to them.

The principal wild animals include the jaguar, puma, ounce, tiger-cat, monkey, tapir, capybara, porcupine, sloth, and ant-eater. The titi, a diminutive monkey only 6 inches in length, is a species peculiar to this country, and the most elegant varieties of it are found only on the banks of the Casiquiare. The vaquira, a kind of wild hog, though much smaller than the tapir, is more formidable, and when in large herds fearlessly attacks the hunter. The jaguar or American tiger, being hunted for the sake of its highly-prized skin, is growing rare. Immense herds of wild cattle roam over the plains; and they are slaughtered in vast numbers for their hides and tallow. The chiguire—an amphibious animal resembling a large otter—is often domesticated in ponds for the sake of its flesh, which is deemed to be fish, and is eaten during fasts. Besides dolphins of great size which ascend the rivers, the manati, often weighing 800 lbs., is found in the Orinoco and its affluents at the foot of the Andes, as well as in Lake Maracaibo. Birds are numerous, especially those belonging to the Falconide, Ardeide, Strigide, and Peittacide. There are also pelicans, wild geese and ducks, and flamingoes. The alligator abounds in the Orinoco, Apure, and Portuguesa, and is likewise found in several other rivers. The iguana is eaten and considered a dainty. Crocodiles, rattlesnakes, boa-constrictors, and several kinds of venomous snakes are met with.

Venezuela is not rich in minerals. Gold, silver, tin, copper, iron, and lead occur; but only gold and copper are worked profitably. Coal, natron, salt, petroleum, and asphalt are found in different places.

*Inhabitants.*—The population consists of aborigines, of the Spaniards and Africans who have settled in the country, and of the offspring which has resulted from the mixture of these three nations. The aborigines are generally copper-coloured, some being very dark, while others are almost as fair as Europeans. More than one-third of the inhabitants are people of colour, i.e., mestizoes, mulattoes, zamboes, and other mixed breeds. The creoles, or people of European descent, amount to about one-fourth; and the domesticated Indians number about one-sixth. The aborigines and coloured inhabitants are docile and industrious, and are the manufacturers, miners, and agriculturists of the country. The besetting sin of the other

racies is indolence, which much retards their social progress. The 50,000 independent Indians add nothing to the strength or resources of the state. Among the nations which may be regarded as parent stems of this various and alienated progeny, that of the Caribs holds the first rank. These are tall, strong, courageous, and intelligent.

*Government, Manufactures, Commerce, &c.*—The constitution devolved on Venezuela by the parent republic of Colombia is a slightly modified copy of that of the United States. The government is vested in a Senate and House of Representatives, the executive power being in the hands of a president and vice-president. The inhabitants enjoy entire personal freedom, and the press is also free. Capital punishment has been abolished. The Roman Catholic religion is the religion of the state, but other creeds are tolerated. The clergy are held to be strictly subordinate to the civil power. The papal sanction, when required, is transmitted through the government, which also administers the patronage of the church. The president and vice-president are elected by means of universal suffrage, for a term of two years only; the former has no veto over the acts of the legislature. The revenue of the republic amounts to about £1,400,000 per annum, rather more than half being derived from customs duties. The external debt was £2,721,616 in 1884.

The few manufactures of the country are in the Sierra Nirgua, and on the declivities of the Andes, at Tocuyo, Barquicimento, Trujillo, and Merida, where straw-hats, hammocks, coarse cotton cloths, some worsted stuffs, and earthenware are made. The natural aptitude of the Venezuelan artisan is, however, being rapidly applied to manufactures. Agriculture is the usual occupation of the people; but scarcely one-tenth of the fertile districts has yet been brought under cultivation. The commerce of the country is important. The trade is principally with the United States, Great Britain, France, Germany, and Spain. Besides coffee, cocoa, sugar, indigo, and cotton, the exports annually comprise hides and large quantities of live stock, tallow, horns, &c.; tobacco, salt, cotton, sarsaparilla, dye-woods, and timber. The principal imports are woven fabrics—chiefly cottons and linens—flour and provisions, hardwares, wines, and specie. The exports from Venezuela to Great Britain in 1886 were valued at £144,877, and consisted of coffee, cocoa, copper ore, and dyewoods. The imports from Great Britain comprised mainly cotton and linen manufactures, and amounted in the same year to £450,885. Much has been done to improve the means of transit, and there are about 200 miles of railway in operation. The capital is CARACAS.

*History.*—The most eastern part of the coast of Venezuela, and the Island of Margarita, were discovered by Christopher Columbus in his third voyage, 1498, and the following year the whole northern coast of South America, from the Gulf of Paria to Cape de la Vela, in New Granada, was explored by Ojeda and Vespucci. The first settlements on the continent were at Cumana, which was built in 1520. In 1731 Venezuela, which up to that time had formed a part of New Granada, was separated from that country and received a captain-general. It remained under the sway of Spain till 1808, when, Napoleon having deposed the royal family and made his brother Joseph king of Spain, Venezuela, like all the American colonies of that country, declared for the ancient dynasty. Dissatisfied, however, with the measures of the regency, it proclaimed its independence in 1810. In 1812 it was brought back again to its former political condition by Spanish power. In 1813 BOLIVAR began his struggles for the liberation of his native country. After the Spaniards were defeated, New Granada and Quito united with Venezuela, and formed one republic under the name of COLOMBIA. This union was effected by deputies in 1821; but in 1830 they separated amicably, and since that time they have



constituted the three republics of Venezuela, New Granada (now Colombia), and Ecuador. In 1846 a war broke out between the white and coloured population, which did not cease till 1849. After that time the republic suffered greatly from intestine dissensions, leading to an almost continuous civil war; but these disturbances ceased in March, 1875, and trade and commerce rapidly improved.

**VENGEUR, MYTH OF LE**, one of the most successful falsehoods ever perpetrated in modern times, since it not only deceived the whole nation of France and two eminent English historians, but flourishes even now, a century later, and after its complete and thorough exposure.

The myth refers to the famous victory of the "first of June" (1794), when Lord Howe defeated the French fleet off Ushant, taking six ships. *Le Vengeur* (seventy-four guns), alone, it was said, of the remnant of the French fleet, refused to flee, or rather could not, being lamed fore and aft. Refusing to surrender, the crew fired a last broadside, then rushed to the upper deck shouting "Vive la République," and went down with the ship to a man, the flag gloriously flying from the masthead. The Convention struck a medal to commemorate the "triumph of the *Vengeur*," a model of her was made and put up in the Pantheon, and from that day to this the heroic crew of the *Vengeur* has reaped harvests of applause. Alison also gives the tale as true in his history.

There is not a word of truth in this stirring myth, except that the *Vengeur* did sink. She made off as well as her disabled state would permit, towed by a French brig, at the conclusion of the action. The *Culloden* pursued her, and she hauled down her flag. The *Culloden's* boats took her prisoner after half an hour's chase, and 127 men were taken off the sinking ship by them and 149 by other English boats. This was clearly proved by Admiral Griffiths, who was on the *Culloden* in 1791. Letters from Renaudin, the French captain, and last of all the original despatch of Renaudin to his own government, entirely corroborating Admiral Griffiths, were brought out in the controversy. This exposure was in 1838, and Barrère was still alive, but he refused to explain his all-too-famous report. Yet, in the face of this, of the full account, with documents, in Carlyle's *Miscellanies*, and of the correction the great historian inserted in his "French Revolution," the favourite legend remains a stock story in France to this day, "founded, like the world itself, on nothing; the largest, most inspiring piece of *blague* manufactured for some centuries"—confesses Carlyle in the later editions of his history—"by any man or nation."

**VENI CREATOR SPIRITUS**, a very famous hymn to the Holy Spirit, attributed to Saint Gregory the Great, and found in the Roman Breviary. It is translated in the English Church Service, with a few other noteworthy hymns of the elder faith, at the conclusion of the Metrical Version of the Psalms. The translation begins:—

"Come, Holy Ghost, Creator, come,  
Inspire the souls of thine!  
Till every heart which thou hast made  
Is filled with grace divine."

**VENI SANCTE SPIRITUS**, an ancient sequence of the Roman Catholic Missal, used in the Mass of Pentecost Sunday, and celebrating the Holy Spirit. It is in the accented rhymed verse usual in these sequences (the "Stabat Mater" being the best known example), and its author is, apparently on very good authority, given as King Robert of France, the son of Hugh Capet (died 1031). It must by no means be confused with the very different, far finer, and older hymn in classical metre, **VENI CREATOR SPIRITUS**, which belongs to the Breviary. The first triplet runs thus:—

"Veni, Sancte Spiritus,  
Et emitte collibus  
Lucis tue radium."

**VENICE** (*Venezia*), a city in Northern Italy, formerly the capital of the republic of Venice, is situated on a number of islands in the lagoons on the north-western extremity of the Adriatic, at a distance of 70 miles east from Verona, and the same distance west by south from Trieste. The population of the city and its dependent islands in 1882 was 145,637. The lagoons are partially separated from the sea by a long spit of land called the Littorale, which, however, is broken into several islands by openings, whereby ships pass up the channels to Venice. The islands on which the city stands are about eighty in number, divided from each other by narrow canals, which form the highways of communication, as streets in other towns, and are spanned by 450 bridges. Narrow streets and lanes, alleys and courts, separate the buildings of each island from one another, and there are also narrow quays in some places along the canals. Carriages and horses are useless, and therefore not seen in Venice, and their place is supplied by boats called *gondolas*, which are continually plying in all parts of the town.

Most of the houses, in addition to their main entrance by water, have a land side communicating with a *calle* or lane for foot passengers. These streets or lanes are so narrow and intricate as to render the city a vast labyrinth. Venice is 2 miles distant at the nearest point from the mainland, and has a circumference of about 8 miles. There is a tide from the Adriatic, which rises a few feet over the lagoons, some of which are left nearly dry at ebb, excepting the seven large channels, which keep up the communication between the city and the ports of Malamocco and Chioggia on the Adriatic, and the landing-places of Mestre, Fusina, and others, on the mainland.

Venice is defended on the land side by the water, and on the sea side by the land, the only approach to it being through narrow openings, commanded by powerful batteries crossing their fire with each other.

The city is divided into two parts by the Canal Grande, of a serpentine character and 100 to 180 feet wide, over which there are three bridges, the Rialto, which is built of white marble, and consists only of a single arch, and two others of iron. The roadway of the Rialto is lined with shops, and the view from it is one of the finest in Venice. Another and much broader canal, or rather arm of the sea, bearing the names of Canal della Giudecca and Canal di San Marco, divides the town from the long island and suburb of La Giudecca, and from the neighbouring island of San Giorgio. Venice has a great number of churches and seven synagogues, is the see of a Roman Catholic primate, and of Greek and Armenian bishops. A great want of Venice is a supply of good drinking water. There are nearly 7000 rain-water cisterns dug since 1300, and about twenty artesian wells bored during the latter half of the present century. Their depth, however, is only 450 feet, and the water is either ferruginous or gaseous. The city also suffers from the silting up of some of the channels in spite of dredging and the construction of dykes and breakwaters.

The Piazza San Marco is the realization of a fairy tale; and neither painter nor writer can give an adequate representation of the wonderful sight. On two sides are the handsome structures of the Procuraties; to the right the Campanile rises 300 feet in the air; to the left is the clock-tower, surmounted by automatic bronze giants holding hammers upraised ready to strike the hours; in the background is St. Mark's Church. In front of the church rise three red flag-poles, shod with beautiful bronze pedestals; while at the right hand corner you catch a glimpse of three or four of the windows of the ducal palace, with its walls of white and rose marble. The piazza is the centre of Venetian life. In the arcades are four cafés, of which the most famous is the Café Florian, renowned for its excellent coffee for more than a hundred years. Towards

sunset these four cafés occupy two-thirds of the vast square with their little tables and chairs, leaving only a passage free down the middle; and on the four or five nights a week when the military band plays, every chair is taken, and the crowd remains thick until midnight.

The nucleus of the Church of St. Mark—the tutelary saint of Venice, whose remains are said to have been brought by Venetian citizens from Alexandria in 829—consists of a Romanesque building of the tenth and eleventh centuries, the brick walls of which are now concealed by a lining of marble. In the twelfth and thirteenth centuries it was remodelled in a Byzantine style, and decorated with the lavish and almost Oriental magnificence which now excites admiration and wonder. The façade received some additions in the Gothic style in the fifteenth century, which enhance the fantastic effect of the whole. The form of the edifice is that of a Greek cross (with equal arms), covered by a Byzantine dome in the centre, and one at the extremity of each arm. Externally and internally the church is adorned with 500 columns of marble (mostly Oriental), the capitals of which present an exuberant variety of styles. The mosaics cover 46,000 square feet, and the interior is also profusely decorated with gilding, bronze, and marble. The high altar (under which repose the relics of St. Mark) stands beneath a canopy of *verde antico*, borne by four columns of marble. The *Pala d'Oro*, enamelled work with jewels, wrought on plates of gold and silver, executed at Constantinople in 1105, constitutes the altar-piece, which is only uncovered at high festivals. The Church of St. Mark is not the cathedral of Venice, though it is the most splendid and most gorgeous fane of the city.

Over the principal portal of St. Mark's are four horses in gilded bronze, 5 feet in height, which were long supposed to be the work of a Greek master, but are now believed to be of Roman workmanship, probably of the time of Nero. They are among the finest extant ancient bronzes, and are especially valuable as the sole existing specimen of an ancient quadriga preserved intact. They probably once adorned the triumphal arch of Nero, and afterwards that of Trajan. Constantine caused them to be conveyed to Constantinople, whence the Doge Dandolo brought them to Venice in 1204. In 1797 they were carried to Paris by Napoleon I., where they afterwards occupied the summit of the triumphal arch in the Place du Carrousel. In 1815 they were brought back to Venice, and restored to their former position.

Opposite St. Mark's is the isolated square campanile (see *PLATE CAMPANILE*, Vol. III.), 322 feet in height, and from the summit of which there is a fine view of the city. Near it is the former library, which now belongs to the royal palace. The library was built by Sansovino in the sixteenth century, and is one of the finest secular edifices in Italy.

Adjoining the Church of St. Mark's is the vast and massive ducal palace, which was the seat of the former republican government, and contains the halls of the various councils of the administration. The Sala of the Senate, or Pregadi, is still in the same state in which it was before the fall of Venice; that of the Council of Ten has been converted into a gallery of paintings. The vast hall in which the Great Council used to assemble, is now the repository of the library of San Marco, which includes 130,000 volumes and 10,000 MSS. All the apartments are adorned with paintings by the masters of the Venetian school, commemorating the great events and the leading characters in the history of the republic. The whole building has undergone a thorough renovation in recent years. The Sotto Piombi, or attics ("beneath the leads") of the Palace of the Doges, formed the state prison, and on the ground floor were the pozzì, or dungeons, the horrors of which have excited the imagination of poets and romance

writers. The Bridge of Sighs connects the ducal palace with these prisons. It was so named from the prisoners being led over it on their way to execution. The piazzetta, or lesser square of San Marco, which is open on one side to the sea, has two handsome pillars of granite brought from Greece in the twelfth century. Upon one is the winged lion, of brass, the emblem of the republic, known by the name of the Lion of St. Mark, and upon the other stands a statue of St. Theodore, its former patron saint. In 1887 an equestrian statue to Victor Emmanuel was added to the monuments of Venice.

Among the many remarkable churches of Venice, besides the Church of San Marco, the following deserve especial mention:—San Giorgio Maggiore, constructed by Palladio, has the sepulchral monument of the Doge Domenico Michieli, the conqueror of Jaffa, Tyre, and Ascalon, and the "terror of the Greeks." Il Redentore, also by Palladio, one of the handsomest churches in Venice, situated on the island of La Giudecca, is, like most other Venetian churches, rich in paintings. SS. Giovanni e Paolo formerly contained the famous St. Peter Martyr of Titian, but the picture was burnt in 1867. I Frari is a vast church with numerous monuments, among others that of Canova. In the suppressed convent of the Frari are deposited the archives of the old republic, which are said to fill 295 rooms. S. Maria della Salute, erected by Longhena, a successor of Palladio, contains several pictures which reveal the highest level reached by Venetian art in the middle of the sixteenth century, and are of marvellous originality in thought and composition.

The banks of the Canal Grande are lined with splendid marble mansions of the nobility, some of which are used as offices, and many are falling to decay. The palaces Giustiniani, Pisani, Grimani, Michieli, Contarini, Vendramin (Wagner's last dwelling place), and Manfrini still possess valuable paintings and sculptures.

The Academy of the Fine Arts has been the means of having many fine specimens of the Venetian school, which otherwise would have been lost to Venice. The gallery of the academy contains altogether about 400 paintings, besides models of the Elgin and Aegina marbles, a model of the statue of Theseus conquering the Centaur, by Canova, and a collection of original drawings of Lionardo da Vinci, Michelangelo, and Raffaele. Its two chief treasures are, however, the celebrated "Assumption" by Titian, and "St. Mark releasing a condemned Slave," by Tintoretto.

The arsenal or dockyard at Venice, begun in 1304, and celebrated in Dante's "Inferno," canto twenty-one, is situated at the eastern extremity of the city; it is surrounded by a high wall, and occupies an area of about 2 miles in circumference. When the Abbé Richard saw it (1761–62), there were about forty ships of war, of which twelve were three-deckers, in the docks ready for sea; arms for 150,000 men, and 2500 pieces of brass ordnance, besides 1500 iron cannon, and vast stores of provisions, cables, sails, timber for shipbuilding, brought from the forests of Istria and Dalmatia, and all other appurtenances of such an establishment. At the present day it tells a story of departed glory, being used more as a store-house and museum than for shipbuilding and launches. There is in the arsenal a monument in relief, by Canova, to the memory of Angelo Emo, great admiral of Venice, who died in 1792, and was the last that caused the Venetian flag to be respected in the Mediterranean. At the land entrance is a gate adorned with several statues, and two marble lions, brought from Athens by Morosini in the latter part of the seventeenth century.

Venice has several theatres; that of La Fenice is one of the largest in Italy. It has also a rich cabinet of natural history belonging to the lyceum, two royal gymnasias, an Athenæum of Sciences and Literature, and the Academy of the Fine Arts already mentioned. Besides the library of

San Marco, there are libraries belonging to the different colleges and academies, as well as to several convents and palaces of the nobility.

When the French evacuated Venice in 1814 nearly one-half of the population was in want of charitable assistance. The misery was frightful. The exertions of the Austrian government from 1814 to the insurrection of 1848 had greatly alleviated the distress of the Venetians; pecuniary assistance from the treasury, a better administration of the communal revenue, a great diminution of local taxation, the establishment of a free port, and important public works undertaken at the expense of the government, had restored to the city a considerable measure of prosperity; a railway was completed between Venice and Verona, and the mercantile shipping of the port had assumed a new activity, and traded all over the Mediterranean. But in 1848 the citizens revolted against Austria, offering to become the subjects of Charles Albert, king of Sardinia. After his defeat they formed a republic, and sustained a long siege by the Austrians, to whom the city was, however, ultimately surrendered on 22nd August, 1849, and from that time the Austrian government did not take so much interest in its prosperity as before.

Before the western nations of Europe had devoted themselves to maritime enterprise, Venice naturally became the great mart of commerce between the East and West. The progress of discovery having opened new channels, and other causes concurring, the trade rapidly sank until Venice was incorporated in the kingdom of Italy in 1866, since which new life and energy have been infused into the city. Venice has a commanding position at the head of that great inland sea which seems to bring the Mediterranean into the heart of the European continent; and aware of this great commercial advantage, the municipality set itself to the task of removing every obstacle that prevented their city becoming an important station on the European route to India, &c. The harbour of Venice is ample beyond all possible requirements, but the principal impediment lay in the shallowness of the channels by which the port is approached. In 1875, therefore, the Italian parliament voted rather more than £1,000,000 for deepening and widening the leading canals, and for establishing warehousing docks; and at the present time all vessels, except the largest men-of-war, can pass the whole main channel to the harbour. Additional railway facilities, bonded and other warehouses, commercial docks, patent slips, and dry docks have been provided; while in the city new hotels have sprung up, and the general business aspect of the place has quickened once more into life.

There has also been a revival of many of the ancient manufactures of Venice. The manufacture of glass here was of world-wide celebrity so far back as 674 A.D., and it has again become one of the specialties of Venice. The other manufactures which have been revived are those of brocade and tapestry, antique furniture, and Burano lace. The other principal articles produced are leather, velvet, silk hosiery, mirrors, jewelry, machinery, and bronze castings of works of art.

The Peninsular and Oriental mail steamers commenced running between Venice and Alexandria in 1872; other companies followed, and the result was an immediate and considerable increase in the trade of the port. The principal imports are grain, cotton and woollen goods, and wines and spirits. The chief articles exported are oil-seeds, raw silk, cotton, hemp, glass beads, and enamels.

Venice is one of the most beautiful as well as remarkable and interesting cities in the world. It would not be habitable except for the saltiness of the water, and the ebbing and flowing of the tide; though the rise and fall of the latter, which are always very limited, are in summer so inconsiderable that the canals become stagnant, offensive, and unhealthy. Rains are frequent, particularly in spring; the winter,

though not of great length, is sharp, especially during the prevalence of the north-west wind; while the summer is much hotter than in England, and is also accompanied by occasional visits of the *sirocco*. The mean temperature of the year is 55·6°; in winter, 38°; and in summer, 73° Fahr. Spring-time is the most suitable season for a visit to the city, when there are no stench from the canals, or mosquitoes astir, as in the summer heats; and no bitterly cold winds from the snow-crowned Alps, which are common during the winter months.

There is an extensive public garden, constructed at the beginning of the present century by the French, to whose taste and munificence it is a noble monument. But the square of San Marco is the scene of all the public masquerades and festivals that take place in the city.

*History.*—Owing to the extensive empire acquired by this small state, whose capital, seated on low and marshy islands, surrounded by the lagoons and channels of the Adriatic, at no time contained a population exceeding that of a second-rate English provincial town; owing also to its wealth, its splendour, and its commercial importance; to its triumphs by land and sea; and to the illustrious names that cast glory on its annals—the history of Venice has always possessed a peculiar interest for the student.

It is impossible, however, to trace back its annals with any degree of certainty to a period long anterior to the Roman conquest. A people called the Veneti are said to have inhabited its site when it was made a kingdom by the Gauls, 856 B.C. At that time its boundaries would appear to have been denoted on the north by the Piave, and on the south by the Adige. It was conquered for the Romans by Marcellus, in 221 B.C., and divided into two provinces: *Venetia Prima* or Continental Venice, and *Venetia Secunda*, including the Rialto and its sixty neighbouring islets. Governed by a Roman prætor, the Venetians nevertheless enjoyed considerable political advantages, and sheltered by the world-wide power of the Eternal City throve rapidly as a commercial and maritime people. Thus prosperous was their career until the decay of the Roman Empire threw open their fertile fields and opulent towns to the desolating inroads of the northern hordes, who swept them of all their accumulated wealth, and of all their memorials of art, genius, and magnificence. Continental Venice, ravaged by successive bodies of barbarians, may almost be said to have ceased to exist. The few inhabitants that escaped the swords of Hun and Goth fled for refuge to the lonely islands grouped around Rialto, which soon became the centre of an immigrant population, dependent upon the mother city of Padua, and controlled by twelve Paduan officers, under the title of tribunes (457).

Protected from maritime descents by the shallowness of the lagoons, and defended from invasion from the mainland by a breadth of mud and ooze, this new Venezia, or Venice, slowly increased in population, and attained to a very moderate degree of prosperity. Cassiodorus, a contemporary writer, compares its inhabitants to water-fowl, who had fixed their nests on the bosom of the waves. Fish, he says, was the common, and almost the universal food of every rank; their sole wealth was the salt which they extracted from the sea. But a people, says Gibbon, whose habitations might be doubtfully assigned to the earth or water, soon became alike familiar with the two elements, and the demands of avarice succeeded to those of necessity. The islanders, who were intimately connected with each other, penetrated into the heart of Italy by the secure though laborious navigation of the rivers and inland canals. Their vessels, which were continually increasing in size and number, visited all the harbours of the gulf; and the marriage which Venice annually celebrated with the Adriatic, was contracted in her early infancy.

The strength and importance of the young state were increased in 568 by a numerous immigration of Paduans,



who fled from their city when it was stormed and plundered by the Lombards. A long period of peaceful prosperity followed, only disturbed by the factious quarrels of the rival tribunes, whose offices having been finally abolished in 697, the entire administration of affairs, civil, military, and ecclesiastical, was vested in one person, named Duke or Doge. The first sovereign elected to this supreme power was Anastaso Paululio, or Pauluccio, who retained his crown of gold and sceptre of ivory until his death in 717. Arso, the third doge, whose military genius extended the renown of the republic by several victories against the Lombards, sought to render his office hereditary in his family, but the design provoked an insurrection; he was assaulted in his palace and slain. The Venetian government was then remodelled, and a chief magistrate elected annually, with the title of "Master of the Militia." But this experiment only endured for five years, and the title of Doge was revived in 740, in the person of the son of him who had been assassinated.

The earliest maritime relations of Venice were with the East, and the daring and skill of her seamen speedily enabled her to monopolize almost all its commerce. She concluded, in 809, an intimate alliance with the Byzantine emperor against the Franks, and the latter, under King Pipin, having invaded the Venetian territory, got embarrassed among its shallow lagoons and marshy flats, to their almost entire destruction. The seat of government was then formally transferred to the Rialto, which was connected by bridges with the neighbouring islands, and the united cluster received that historic name of Venice which was so long a word of terror and a symbol of power (811). In 829 the body of Saint Mark was surreptitiously removed from Alexandria to Venice, to the great benefit of the latter city, thousands of wealthy pilgrims being attracted thither by its possession of a relic of such unquestionable sanctity. Thenceforth the Venetians adopted St. Mark as their patron saint, and his lion as their national emblem.

Their wealth rapidly increased, and their ambition kept pace with their augmenting power, which was now extended over a considerable territory on the mainland, and along the sea-boards of Dalmatia and Istria (998). In 1085 they obtained from the Byzantine court the cession of the whole provinces of Dalmatia and Croatia, while so extensive was their commerce, and so vast their maritime influence, that in 1099 they were able to equip a fleet of 207 sail for the succour of the unfortunate heroes of the first Crusade.

"The sea," says Gibbon, in his usual stately phrase, "was their patrimony; the western parts of the Mediterranean, from Tuscany to Gibraltar, were indeed abandoned to their rivals of Pisa and Genoa; but the Venetians acquired an early and lucrative share of the commerce of Greece and Egypt. Their riches increased with the increasing demand of Europe; their manufactures of silk and glass are of high antiquity; and they enjoyed the fruits of their industry in the magnificence of public and private life. To assert her flag, to avenge her injuries, to protect the freedom of navigation, the republic could launch and man a fleet of a hundred galleys; and the Greeks, the Saracens, and the Normans were encountered by her naval arms. The Franks of Syria were assisted by the Venetians in the reduction of the sea-coast; but their zeal was neither blind nor disinterested; and in the conquest of Tyre they shared the sovereignty of a city, the first seat of the commerce of the world. The policy of Venice," continues the great historian, "was marked by the avowal of a trading and the insolence of a maritime power; yet her ambition was prudent; nor did she often forget that, if armed galleys were the effect and safeguard, merchant vessels were the cause and supply of her greatness." In her religion she avoided the schism of the Greeks, without yielding a servile obedience to the Roman

pontiff; and a free intercourse with the infidels of every clime appears to have allayed betimes the fever of superstition. Her primitive government was a strange mixture of democracy and monarchy: the Doge was elected by the votes of the general assembly; as long as he was popular and successful, he reigned with the pomp and authority of a prince, but in the frequent revolutions of the state he was deposed, or banished, or slain, by the justice or injustice of the multitude.

In 1106 the city was ravaged by a terrible conflagration, which reduced numerous churches and public and private buildings to ashes; out of which, to use an old simile, Venice rose like a phoenix, and began that course of architectural splendour which makes her, in her decay, so favourite a shrine of artistic pilgrimage. We may conveniently pause here in our rapid historical survey, to indicate the general character of her palatial magnificence. An accurate writer, Mr. Howells, has justly observed that one can conceive of no state of things more flattering to human pride than that which surrounded the patrician of the old aristocratic republic. The house in which he dwelt was the palace of a king in luxury of appointment and magnificent proportions. "Troops of servants that ministered to his state peopled its vast extent, and the gondolas that carried his splendour abroad were moored in little fleets to the piles that rose before his palace, painted with the family arms and colours. The palace itself stood usually on the Grand Canal, and rose sheer from the water, giving the noble that haughty inaccessibility which the lord of the mainland achieved only by building lofty walls and multiplying gates. The architecture was as costly in its ornament as Gothic fancy or Renaissance luxury could make it, and when the palace front was not of carved marble, the painter's pencil filled it with the delight of colour. The mainland noble's house was half a fortress, and formed his stronghold in times of popular tumult or family fray; but at Venice the strong arm of St. Mark suppressed all turbulence in a city secure from foreign war; and the peaceful arts rejoiced in undisturbed possession of the palaces, which rose in the most delicate and fantastic beauty, and mirrored in the brine a dream of sea-deep strangeness and richness. You see all the strangeness and beauty yet, but the pride and opulence which called it into being are gone for ever."

If the private life of the Venetian noble was distinguished by its superb state, in his political character he had yet greater grandeur. "He was part of the proudest, strongest, and securest system of his time. He was a king with the fellowship of kings, flattered with the equality of an aristocracy which was master of itself and of its nominal head. During the earlier times it was his office to go daily to Rialto and instruct the people in their political rights and duties for four hours; and even when these duties became everything and the rights nothing, the friendly habit of daily intercourse between patricians and citizens was still kept up at the same place. Twice a week, on Thursdays and Saturdays, the noble took his seat in the Grand Council, or the Ten, or the Three, according to his office in the state, holding his place in the senate by right of birth, and in the other bodies by election of his peers."

The special greatness of Venice may be dated from the capture of Constantinople by the Latins in 1204. It is true that in this memorable enterprise, which diverted a mighty armament intended for the recovery of Jerusalem from the Saracens, the French were engaged as well as the Venetians; but the former only as private adventurers, the latter with the whole strength of the republic under its famous doge, Enrico Dandolo. Three-eighths of the Byzantine city, and an equal proportion of the provinces, were allotted to them as their share of the spoil, and the Doge adopted the singular but accurate title, "Duke of

three-eighths of the Roman Empire." Their share was augmented by purchases from the less wealthy crusaders, especially one of much importance, the Island of Candia, which they retained till the middle of the seventeenth century. Generally these foreign acquisitions were granted out in fief to the Venetian nobles, under the supremacy of the republic. It was in this wise that the Ionian Islands came under her dominion, and insured to her that sovereignty over the Adriatic which she now began to claim. Those of the Archipelago she lost in the sixteenth century.

All this political magnificence was sustained and developed by an ever-increasing commerce. No Christian state preserved so considerable an intercourse with the Mohammedans. While Genoa held the keys of the Black Sea by her colonies of Pera and Caffa, Venice directed her vessels to Acre and Alexandria. These connections, remarks Hallam, as is the natural effect of trade, deadened the sense of religious antipathy; and the Venetians were sometimes charged with obstructing all efforts towards a new crusade against, or even any partial attacks upon, the Mohammedan nations.

The commercial rivalry which had so long existed between the Genoese and the Venetians passed, in the thirteenth century, into a desperate struggle for the sovereignty of the seas. In the opening contest the Venetians were successful, and the Genoese fleet suffered a severe defeat near Negropont. An interval of peace was followed by renewed hostilities, in which fortune singularly favoured the Genoese, who almost annihilated the armada of their rivals in the desperate battle of Corzuela, only twelve galleys out of ninety-six effecting their escape. Exhausted and humiliated, the Venetians purchased peace on hard conditions in 1299. Hostilities, however, soon broke out afresh, and, with occasional pauses, continued for upwards of a century. The severest period of this deadly strife was from 1350 to 1381. The Venetians were defeated by Paganino Doria in the channel of the Bosphorus, 13th February, 1352. They, in some measure, retrieved their reputation by a victory off the Sardinian coast, 29th August, 1353; but were again defeated, and their fleet almost destroyed, in the Gulf of Sapienza, 3rd November, 1354. In the following May they made peace, but in 1378 the old fires again flamed forth, and they took advantage of a quarrel between the Genoese and Cypriotes to attack the fleet of the former off Antium. Their success was dearly purchased, for the Genoese equipped a formidable armada, which they placed under the command of Pietro Doria; and encountering the Venetian squadrons while ill-armed and weakly manned, gained so complete a victory that only seven galleys escaped to bear the sad tidings of disaster to Venice. In their wake followed the triumphant Genoese, who resolved to reduce the city, and blot out her name from the list of independent nations. Doria forced the passage of the lagoon, and stormed the little town of Chioggia, built upon the inside of the isle bearing that name, about 25 miles south of Venice. In this extremity the republic of St. Mark displayed a courage and a resolution worthy of its ancient renown. It intrusted its defence to its greatest seaman, the Admiral Victor Pisani; and under his vigorous direction the canals were fortified or occupied by large vessels armed with artillery; thirty-four galleys were equipped; every citizen contributed his quota to the national fund; in the entire absence of commercial resources (for Venice did not possess a single merchant ship during this war), private plate was melted, and the Senate promised patents of nobility to the thirty families who should be most forward in the noble strife of patriotism.

In recapitulating the principal events of this great struggle, we shall adopt the excellent summary of Mr. Hallam.

The new fleet, he says, was so ill provided with seamen that for some months the admiral employed them only in

manœuvring along the canals. From some unaccountable supineness, or more probably from the insuperable difficulties of the undertaking, the Genoese made no assault upon the city. They had, indeed, fair grounds to hope its reduction by famine or despair. Every access to the Continent was cut off by the troops of Padua, then in alliance with Genoa; while another enemy, the King of Hungary, had captured almost all the Venetian towns in Istria and along the Dalmatian coast. The Doge Contarini, assuming the chief command, arrived at length with his fleet off Chioggia, to the complete surprise of the Genoese. Pushing one of the large round vessels, then called *cocche*, into the narrow passage of Chioggia which connects the lagoon with the sea, and mooring her athwart the channel, he interrupted that communication. Attacked with fury by the enemy, this vessel foundered, and the doge improved his advantage by sinking loads of stone until the channel became absolutely impracticable. It would still have been possible for the Genoese fleet to have followed the principal canal of the lagoon towards Venice, or to have sailed out of it by the harbour of Biondolo; but whether from confusion or from miscalculating the perils of their position, they suffered the Venetians to close also this canal upon them by the same means they had adopted at Chioggia, and even to station their fleet in the entrance of Biondolo in such immediate proximity to the lagoon that the Genoese could not array their ships in line of battle.

Thus the conditions of the combat and the circumstances of the combatants were entirely reversed. The Genoese fleet was now blocked up in Chioggia, not the Venetians in the Venetian waters. But then the Genoese held an impregnable position, and their command of the land secured them from famine. Notwithstanding her unexpected success, the City of the Isles was very far from safety; it was difficult for the Doge to keep the seas during the storms of winter; and if the enemy should attempt to force a passage, the risks of combat were extremely hazardous. It is said that the Senate deliberated upon removing the seat of St. Mark to Candia, and that the Doge had announced his intention of raising the siege of Chioggia, if certain expected succours did not arrive by the 1st of January, 1380. On that very day Carlo Zeno, an admiral who, ignorant of his country's danger, had been supporting her renown in the Levant, arrived with a squadron of eighteen galleys. The reinforcements revived the hopes and confidence of Venice. Superior in strength to the enemy, her fleet began to press them closely, and after an obstinate resistance the Genoese surrendered. The pride of Genoa was deemed to be justly humbled by this reverse of fortune; and even one of her own historians confesses that God would not suffer so noble a city as Venice to become the spoil of a conqueror.

In the following year peace was concluded between the two rivals, and Venice surrendered most of her territorial possessions to the King of Hungary, and the Island of Tenedos to Genoa. But from this time the power of the latter began to decline; her fleets no longer swept the seas, and her commerce gradually sank into decay. Venice, on the contrary, recovered almost all her losses, and the fifteenth century was the era of her utmost magnificence.

She was not exempt, however, from internal troubles. Of these, the most remarkable was the conspiracy of Marino Faliero, in 1355, which has been immortalized in one of Byron's noblest tragedies, by Casimir Delavigne in one of his finest romances, and whose story has been graphically told by St. Simon. Its object was to overthrow the power of the nobility, and especially of that mysterious junta, the Council of Ten, with the ultimate view of establishing an absolute monarchy. But the Doge was betrayed, summoned before the council, hastily tried, condemned, and beheaded.

Early in the fifteenth century Venice engaged in hostilities with Novello, lord of Padua. The war was sharp but brief; and at its conclusion the republic found her sway extended over the richest portion of the Lombard plain, including the cities of Belluno, Veltro, Padua, Verona, and Vicenza. In 1425 she embarked in the great Italian War, which gradually drew within its vortex not only all the Italian states, but France, Spain, and Austria, and drained the life-blood of the land for barren results. The arms of the republic were, on the whole, successful, and she acquired a considerable extension of territory; but the prolonged struggle robbed her of her male population and her accumulated treasures, while the energies of her people were diverted from those commercial enterprises which had formerly made her rich and strong. She lost many of her fairest Eastern possessions in her war against the Turks, 1461-77; and though she conquered Athens and Cyprus, these gains were more than counterbalanced by that great discovery of Columbus (1492), which threw open to the Western nations the treasures of a new world; and by that inauguration of the ocean route to the Indies (1497), which destroyed her monopoly of the commerce of the East. At the same time her arrogance and cupidity aroused against her a coalition of formidable enemies: the emperor, the Pope, and the French king uniting in the memorable League of Cambrai (1508), which brought her to the very brink of ruin, and though she retained her independence, deprived her of all her possessions in the Milanese and the States of the Church.

Throughout the sixteenth century Venice was at war, exhausting her already declining resources in vain attempts to regain her lost maritime supremacy. Her rulers, however, still indulged their passion for display by adorning the city with many sumptuous structures; in 1592 the beautiful Piazza di San Marco was erected, and the famous bridge of the Rialto. Long before this period the Doge had become a mere puppet, and, deprived of all real power, acted as inspired by the mysterious Council of Ten, or rather by the three members of that council in whose hands the entire resources of the state were virtually deposited by their colleagues. The citizens and nobles of Venice groaned under a peculiarly oppressive tyranny. The spies of the government seemed ubiquitous and invisible, to such perfection was the Venetian system of espionage carried; and no man, however influential or beloved, was safe from the secret denunciation, which brought upon the victim's head spoliation, captivity, banishment, or even death. Such a policy had its natural result in a general demoralization of the people; and during the last period of her independent existence Venice became a luxurious Capua, to which strangers resorted for the sake of the license she offered in the indulgence of the worst passions. In the middle of the seventeenth century she displayed some signs of the spirit that had formerly made her great, and her fleets inflicted two severe defeats upon her ancient enemies, the Turks, at Scio, in 1651, and in the Dardanelles, in 1655. But these were more than counterbalanced by her loss of Candia in 1669. In the last year of the century she recovered a portion of the Morea, but was again dispossessed by her Moslem foes in 1739, and from that date her decline was signally rapid. Her quays were deserted, her commerce became nearly extinct, and her reduced revenues barely sufficed to maintain the empty splendour of her government. In a word, the fruit was ripe for plucking; and when, in 1797, the city was occupied by Napoleon Bonaparte, her rulers and her citizens were equally incapable of one heroic struggle for independence. It might almost be said that she "died and made no sign."

By the treaty of Campo Formio, 17th October, 1797, a part of the Venetian territory was annexed to Austria; the remainder was incorporated in the so-called Cisalpine

Republic, created by the great French commander. This arrangement only endured until 1806, when Austria, humbled at Austerlitz and Wagram, resigned her portion of Venice to the new kingdom of Italy, whose crown Napoleon placed upon his own head, administering it through the agency of a viceroy, Prince Eugene Beauharnais. By the treaty of Vienna, in 1815, Austria obtained the whole of Venetia, which, along with Lombardy, formed the Lombardo-Venetian kingdom, one of the Austrian crown-lands. In 1830 Venice was declared a free port, a measure which, to some extent, revived her commercial prosperity. Under the stern Austrian rule, however, she appeared to lose all the life and light that had once rendered her so attractive; and to the visitors attracted thither by her past renown and her monuments of art, she seemed a city of the dead. Her citizens remembered their ancient glories, and sighed for a freedom which, sooth to say, they had made no great sacrifices to preserve. The Austrian government would fain have governed fairly, but were defied by a stern and unyielding attitude of obstinacy, which forced them into repressive measures. No longer enervated by luxury, the Venetian recovered his former admirable qualities, and in the hope of eventual deliverance submitted to the greatest sacrifices, eschewing everything which makes life easy and joyous, because he must have shared his pleasures with the rulers he hated. Thus, during the continuance of the Austrian sway, the gondolas were deserted, and the theatres empty, and over the vast palaces hung an air of gloom and desolation.

The year 1848 was a year of revolutions, and perceiving the perils of Austria in the discontent of various portions of her ill-jointed empire, the Venetians availed themselves of the time to make a bold stroke for freedom. They rose against the oppressors, and expelled them from the city (22nd March). But no help came from without. The Austrians poured a large army into the Venetian territory, and besieged Venice, which, after a gallant resistance, was constrained to surrender, 22nd August, 1849. From this time the government of Austria became really severe, and the hatred with which it was regarded by the Venetians increased in intensity year by year, amounting to a sublime madness after the failure of their hopes of deliverance in 1859, when they beheld Lombardy freed by the peace of Villafranca while their own shackles remained undone. The condition of things which existed from 1859 to 1866 was thus described by an acute and trustworthy observer:—"The stranger in Venice," he says, "finds himself planted between two hostile camps, with merely the choice of sides open to him. Neutrality is solitude in Venice, and friendship with neither party; society is exclusive association with the Austrians or with the Italians. The latter do not spare one of their own number if he consorts with their masters, and though an alien might expect greater allowance, it is never shown to him. There are all degrees of fineness in Venetian hatred, and after hearing certain persons pour out the gall of bitterness upon the Austrians, you may chance to hear these persons spoken of as tepid in their patriotism by yet more fiery haters. To be seen in the company of officers is enmity to Venetian freedom, and in the case of Italians it is treason to country and race. Of course, in a city where there is a large garrison, and a great many officers who have nothing else to do, there is inevitably some international love-making, although the Austrian officers are rigidly excluded from association with the citizens. But the Italian who marries an Austrian severs the dearest ties that bound her to life, and remains an exile in the heart of her country. Yet it must not be supposed that the Italians hate the Austrians as individuals. They are simply hated as the means by which an alien and despotic government is imposed upon a people believing themselves born for freedom and independence."

In 1866, when war broke out between Prussia and

Austria, Italy eagerly accepted the Prussian alliance, and moved against Venetia. The Italian army was defeated at Custoza, and the Italian fleet at Lissa; but Austria was compelled to maintain a twofold struggle at a time when she needed every man and every gun for the defence of her German provinces. The result was her total defeat, and almost annihilation, on the field of Sadowa. After this Venice and such of her former territories as were under Austrian rule were ceded to Napoleon III.; he immediately placed the government in the hands of the municipal authorities, who at once called upon the people to vote on the question of annexation to the kingdom of Italy. The election was held in October, and out of upwards of 650,000 votes cast all but 69 were in favour of annexation. Victor Emmanuel made his entrance into Venice 7th November.

Venice, we may add, was ruled by 122 doges in all; from Anastaso, in 697, to Luigi Manin, in 1797. In both art and literature she can boast of immortal names. The Venetian school of painting rivals that of Florence or Rome. The beauties of Venetian architecture, with its gorgeous ornamentation, are unique. Venice has had the singular fortune to inspire the genius of many foreign writers, and in English poetical literature she is indissolubly associated with the memory of Shakespeare, Otway, Byron, and Rogers; while her splendid palaces, churches, and monuments have never found among her own sons an abler or a more enthusiastic commentator than Ruskin.

**VENICE, ARCHITECTURE AND PAINTING AT.** See VENETIAN ARCHITECTURE and VENETIAN SCHOOL OF PAINTING.

**VENICE, GULF OF.** the name given to the north-west part of the Adriatic Sea, where it forms an indentation in the coast of Venetia, extending about 50 miles from the mouth of the Tagliamento to the delta of the Po. The Gulf of Trieste is its north-east prolongation. Its depth is not more than 12 fathoms. It receives the waters of the Piave, Brenta, Adige, Po di Levante, Po della Maestra, and other rivers.

**VENLOO**, a fortified town of the Netherlands, in the province of Limburg, on the right bank of the Maas, 40 miles N.N.E. of Maestricht; population, about 8000. It has a large Catholic church, a fine town hall, two arsenals, a school of industry and design, manufactories of tobacco and other articles, tanneries, breweries, and distilleries, and much trade in hogs. A suspension bridge connects the town with Fort St. Michael on the left bank of the Maas; on the right bank is Fort Ginkel, and opposite Venloo is the fortified island of Waert or Weert. The place has undergone many sieges.

**VENOMOUS BITES AND STINGS.** Animals possessing a power of secreting and ejecting a poison, which when inoculated in man or other animals will produce hurtful or fatal effects, are found in many classes of the animal kingdom.

Of these the more important and dangerous are the venomous snakes. Snake poison when fresh is a clear, slightly viscid fluid, sometimes transparent, at other times of a yellowish or greenish tint, much resembling saliva in its physical character. Analysis has shown it to be very nearly like albumen in composition, its active principle being distinguished as *viperine*, *echidnine*, or *crotaline*. The local effects of snake-bite include pain, numbness of the bitten part, swelling in the neighbourhood of the wound, and, should the patient escape fatal consequences, the formation of a sloughing sore. The constitutional symptoms at the same time include alarm and depression, sickness, hurried breathing, exhaustion, fainting, lethargy, paralysis, convulsions, coma, and death. It was formerly supposed that snake poison produced no effect when introduced into the stomachs of living animals or when smeared upon an unbroken skin; but there is reason for doubting this theory, and should it be necessary to suck a snake-bite the poison

should be ejected instantly with the saliva, and the mouth rinsed as quickly as possible. The potency of the poison is affected by many circumstances, and it varies in activity in the same species or individual according to season, temperature, and physical condition. In England the only venomous snake is the viper, the poison of which is destructive to small animals, and may even cause death to children or persons of weakly constitution, but adults as a rule escape with the pain and local disturbance caused by the wound. In the case of the more deadly snakes of the tropical and sub-tropical regions, such as the ophiophagus, cobra, rattlesnake, echis, cerastes, and others, the bite is followed almost immediately by severe constitutional disturbance, which increases rapidly in intensity and is followed by death from arrest of respiration in a few hours. In most places where poisonous reptiles are found, there are sundry agents which have a good local reputation for the cure of snake-bite; but in the majority of cases such supposed remedies prove to be of no efficacy when tested experimentally. The rational treatment of snake-bite, so far as medical science can suggest up to the present, is to endeavour to prevent the entry of the virus into the general circulation, to neutralize it in the wound before it is absorbed into the system, to favour where possible its elimination, and lastly to support the failing nervous strength of the patient, so as to enable him to struggle against its toxic effects. If the situation of the wound will permit, the spot bitten should be immediately excised, or a tight ligature may be placed above the wound, and the latter may then be cleansed by sucking (subject to the conditions already mentioned), bathing with warm water, or better still, by applying an exhausted cupping glass to the spot. The general or constitutional measures consist in the free administration of stimulants, such as alcohol and ammonia, the use of stimulating diuretics, and artificial respiration when the breathing begins to fail. In such cases the toleration of stimulants is very remarkable, and persons suffering from snake-bite can sometimes imbibe huge doses of raw brandy or whisky without displaying any symptom of intoxication. In the western states of America the popular method of treating the bite of the rattlesnake is to administer whisky until the bitten person is intoxicated, when it is supposed the effect of the poison has been neutralized in the alcohol. Other remedies are found in the preparations of ammonia, which are administered internally as stimulants, and are also injected into the veins. The bite of the English viper is usually treated by the local application of hot olive oil, the use of olive oil internally, and by the administration of stimulants.

Next in importance to the snakes are the scorpions and centipedes, the sting of the former and the bite of the latter being alike followed by serious local and constitutional symptoms. The local effects are pain and swelling, and these are attended by vertigo, sickness, temporary loss of vision, swelling of the tongue, and fever. In persons of delicate or irritable constitution these symptoms may be followed by death, but generally where the persons bitten or stung are healthy the suffering is chiefly local and passes off in a few days. Suction of the wound and the application of brine, vinegar, alum, ammonia, ipecacuanha, spirits of camphor, turpentine, tincture of iodine, alcohol, and solutions of opium and lead, are the measures usually recommended to alleviate the pain and irritation; while the constitutional symptoms may be treated by the administration of suitable diffusible stimulants or sedatives.

Many insects have the power of inflicting painful stings, or of making punctures in the skin in order to draw blood. Of the former class the most familiar examples are to be found in bees, wasps, and hornets. The sting of the bee or the wasp scarcely ever proves fatal, except where it occurs in the throat, as may happen when the insect is concealed in ripe fruit, and in this case the danger arises from the

swelling of the part affected. In ordinary cases it is sufficient to pluck the sting out of the wound, and to apply vinegar, *eau de Luce* (which is a preparation of ammonia), solution of soda or potash, oil, indigo, *eau de Cologne*, alum, &c. Where the throat is implicated surgical aid must be sought, as it may be necessary to resort to internal scarification or the operation of laryngotomy. Among other insects which are dreaded for their bites are gnats, mosquitoes, sandflies, and gadflies, some of which are capable of causing a good deal of pain and irritation, especially in the case of young and full-blooded persons. Treatment consists in the application of salt and water, solution of ammonia, soda, potash, lead, oil, or ipecacuanha, the more violent inflammatory symptoms being dealt with by ordinary surgical measures. The celebrated *Tæ-reæ* fly, so graphically described by Dr. Livingstone, and whose account of which has been confirmed by later travellers, causes certain death by its bite to horses, cattle, sheep, and dogs; but it is innocuous to the goat, antelope, ass, and pig, and it causes no ill effect in man beyond a slight irritation.

Some of the jelly-fish found in northern waters have the power of stinging, and when they come into contact with the naked bodies of bathers a good deal of pain may result. The feeling at first resembles very much the pain caused by touching a nettle, and it is followed by considerable irritation. The application of vinegar or olive oil is said to remove the unpleasant symptoms, and a lotion of spirits and water is sometimes recommended for the same purpose.

**VENTIL**, a musical contrivance used in brass wind instruments, instead of sliding tubes, like those of the trombone, to shorten the tubes by various degrees, and so to produce fresh series of notes, through the operation of valves, opening or closing certain sections of the tube, which is convoluted for this purpose. The tone of the vent<sup>i</sup>\*horn is, however, not so fine as that of the horn without vents.

Ventil is also the name applied to certain stops of the organ which act in precisely the opposite way to ordinary drawstops. The latter admit wind to certain sets of pipes, but the vents cut off the wind from the pipes to which they refer. See **ORGAN**.

**VENTILA'TION**. Upon the paramount necessity of fresh air there is no need to enlarge: it is as great a source of vitality as food or drink, and the pains of suffocation are as exhausting and as deadly as the pains of hunger, though their rarity, in an intense degree, clouds the fact. Occasionally a catastrophe, like that of the Black Hole of Calcutta, reminds us that the limit of change required to make air unfit for breathing is not very great. On the other hand, headaches from close rooms are of daily occurrence, and by ignorant persons are set down to any cause but the right one; though we are bound to admit that ignorance on this subject is rapidly becoming a thing of the past. The curtained four-poster, the padded door and window sash, the general tendency to make a room a sort of hothouse—these are now quite unusual, among younger people at all events, and every one is ready to listen attentively to any new and plausible scheme for purifying the air of our houses.

The problem is twofold: how to take foul air out, and how to let fresh air in. The open fire, so dear to the British heart, is a splendid ventilator. Unfortunately it is by no means judicious. Steady streams of cold air flow to it from door and window, and those who huddle over the fire on a cold night are roasted in front while they freeze behind. Sensitive people therefore warm the halls of their houses by a fire, a stove, or a hot-water apparatus, and thereby lessen the sharp draught into the rooms, and do away with the distressing change of temperature when leaving one room for another and passing through the ice-cold hall. Since the fumes of gas, the expired breath, &c., are

warm, they ascend to the ceiling of the room, and the ventilating power of the fire is therefore impaired; the obvious remedy has long suggested itself, to use the chimney as a ventilator, and by opening a grating into it (properly protected against a return current, which would bring smoke into the room), we utilize the upward rush of warm air from the fire. It remains to supply fresh air from without, in such a manner as to avoid draught. This is best done by what is known, from the name of its inventor, as Tobin's system. An opening in the outer wall communicates with a vertical tube placed against the inner side of the wall: on warming the room a current is at once produced, but the cold fresh air is rigidly confined to its one vertical direction, and when it issues from the tube, at about 5 feet from the floor, it has so thoroughly acquired this direction that it will ascend to the ceiling almost without spreading—a fact instantly tested by holding a taper near the orifice or elsewhere near the stream. Arrived at the ceiling, the fresh air mixes with the foul air and purifies it, spreading all over the ceiling as water flows over a dish into which it is poured from one corner. If the proper tubes cannot be fixed, an excellent substitute is to bore holes through the middle horizontal window bar, or to raise the lower sash 2 inches by a bar of wood laid along the window sill: the air thus enters the room and creeps up the window in small-tubular currents or in a thin sheet, striking the ceiling, and then spreading beneath it at the top of the room. In the same way it is often usual to bore through the lintel of a door frame, and so introduce air to the ceiling from the hall or passage without, in an upward slanting stream.

The ventilation of large and crowded areas is usually best done by somewhat the same means as that adopted in coal mines, where a constant current is kept up one shaft by means of a furnace, and the consequent upward current thus created is compensated by a downward current of fresh air supplied by other shafts. The doors in the mine are arranged to direct the current thus obtained so as to ventilate every part of the mine. A similar system is used to ventilate the Houses of Parliament: the air which is supplied being warmed and purified by water spray, and the foul air drawn off by a furnace draught.

Many appliances are constantly being invented to try and warm the fresh air supplied to a room, by causing the fire or stove to be approached by it in its journey into the chamber. This problem is as yet not fairly solved.

The amount of fresh air continually required is by no means inconsiderable. It is agreed that a man vitiates nearly 10 cubic feet of air a minute, and a burning gas-jet vitiates far more. At least 30 cubic feet a minute are required to be changed, therefore, in an ordinary room with one occupant and one lamp. When, as is usually the case, there are assembled four or five people and two or three burning lamps, 100 cubic feet a minute of fresh air will certainly be required to keep the room absolutely untainted.

The *Æolus* water-spray, which came into favour about 1885, is a very successful method of cooling and purifying the air of a large room, public hall, or theatre.

**VENTNOR**, the principal town and watering-place, or health resort, on the south shore of the Isle of Wight, 12 miles from Ryde, with which it is connected by the Isle of Wight Railway. Owing to its warm and equable temperature, and its situation among some of the most romantic scenery of the famous Undercliff, it has become a favourite residence with invalids. Its salubrious climate was first pointed out by Sir James Clark, late physician to the queen. It consists of several clusters of handsome villas and lodging-houses, with some good shops, commodious hotels, an admirable esplanade, a literary institute, and several churches, which possess more than ordinary architectural excellence. In the neighbourhood is Steephill Castle. A consumptive hospice, on the plan of having a room facing



the sea for each patient, was completed at Ventnor in 1875. Bonchurch, St. Lawrence, Blackgang, Bonifacio Down, and Shaullin Chine are all within easy distances. The growth of Ventnor has been rapid: in 1801 it consisted of half a dozen fishermen's huts; it is now a thriving town with a population of 5504.

**VENTRE INSPICIENDO, WRIT DE.** When a widow is suspected to feign herself with child in order to produce a supposititious heir to the estate, the heir presumptive may have a writ de ventre inspiciendo to examine whether she be with child or not; and if she be, to keep her under proper restraint till delivered, which is entirely conformable to the practice of the civil law; but if the widow be, upon due examination, found not to be pregnant, the presumptive heir shall be admitted to the inheritance, though he hath to lose it again on the birth of a child within forty weeks from the death of a husband.

The form of the English writ de ventre inspiciendo is given Co. Litt., 8 b. It is directed to the sheriff, and commands him to empanel a jury of twelve women to search whether the widow be enceinte. If they find that she is with child another writ issues which commands that she shall be safely kept and duly inspected by the women, who must be present at the delivery.

**VENTRICLES** (diminutive of Latin *venter*), the main chambers of the heart. [See HEART.] Also some hollow spaces in the brain. See BRAIN.

**VENTRIL'QUIISM** (literally "belly-speaking," from Lat. *venter*, the belly, and *loqui*, to speak) is a vocal mimicry of sounds, by which an illusion is produced on the hearer, who supposes that the sound comes not from the mimic, but from some other place.

The name, or rather its cognate terms in Greek and Hebrew, originated from the practice of the witches, wizards, and persons supposed to have a familiar spirit among the Canaanitish nations and the Jews, and the diviners or prophesying priests and priestesses of the Greeks, causing the answers to the questions asked by those who consulted them to proceed apparently from the abdomen, in which, as they alleged, resided their familiar spirit or demon. The Hebrew term *shô'el ôb*, rendered in the Authorized Version "having a familiar spirit," is supposed by some interpreters to signify those who spoke from the belly, though *ôb* signifies rather a (skin) bottle, but the Greek term *engastrimanteis*, belly-seers, indicates plainly the nature of the imposture practised. The first attempts at ventriloquism were probably made in Egypt or India, in both of which countries it has been known from the earliest periods, and we find from numerous references in the Old Testament that it was practised both by the Hebrews and their neighbours from the beginning of their history. In the laws ascribed to Moses the penalty of death is awarded to those who professed to have a familiar spirit (Lev. xx. 27), but the people seem to have persisted in the practice, for we find in Isa. xxix. 4, a reference to the voice in which such wizards spoke, which plainly infers that it was a well-known sound to the hearers of the prophet. Nor did the practice cease as a pretended means of revelation in the early centuries of the Christian era, as the repeated references of St. Chrysostom and other early Christian fathers sufficiently prove. Its use for such purposes was finally abandoned during the middle ages, but the practice of the art seems never to have wholly died out, and in the early part of the sixteenth century Louis Brabant, valet-de-chambre of Francis I., is said to have obtained the consent of the mother of his betrothed, and to have extorted a large sum of money from a miser, by its means. In 1772 the Abbé de la Chapelle published an account of two eminent ventriloquists, Baron Mengen of Vienna and M. Saint-Gille, a Frenchman, who were very successful in producing illusions by means of vocal mimicry. M. Saint-Gille displayed his skill before commissioners of

the French academy of sciences, who investigated the subject with great care. Since that period ventriloquism has become common, and most of the abler so-called magicians, wizards, and sleight-of-hand performers practise it. M. Comte, a celebrated French ventriloquist, was the first to demonstrate the possibility of cultivating it by scientific methods, and several eminent singers have resorted to it to produce unusual musical effects. It was supposed for many years, and eminent physiologists gave countenance to the theory, that some peculiar conformation of the larynx was requisite for ventriloquism, or at least, that it was accomplished by processes essentially different from those adopted in ordinary speaking and singing; but it has been demonstrated that the vocal organs of the ventriloquist are the same as those of other men, nor is his use of them materially different from that of others. For success in his art, however, he requires keen perception, an ear delicately attuned to the variations of sound produced by distance or direction, and a strongly developed mimetic faculty. The vocal powers have the power of imitating, under skilful training, all the sounds of animate or inanimate life, and the mimicry of such sounds as are produced by birds or common animals, or are produced in knife-grinding, sawing, and planing wood, &c., generally forms part of the stock-in-trade of the professional ventriloquist. In the same way sounds and words may be uttered in such a way as to cause the listener to suppose they are coming from a distance greater or less than that at which he sees the performer. We do not distinguish directly the distance which a sound has travelled from its source, but we judge the distance, relying upon our former experience to enable us to compare the loudness which we hear with the known distance and known loudness of similar sounds heard on former occasions. The ventriloquist takes advantage of this fact, and aims to utter the sound with the effect it would have upon the hearer's ear if it had really traversed the distance he designs it to represent, reducing its loudness, softening somewhat its quality or tone, and, if it is in words, obscuring a little the consonant sounds, while retaining unaltered the pitch and duration; or by preserving the same pitch, quality, and duration, but with an accurately graduated reduction or increase of loudness, a series of sounds may be created which, falling in succession on the ear, will suggest to the mind a constantly increasing or diminishing distance of the sound's source. The direction also whence a sound comes seems to be judged of by the right or left ear receiving a stronger impression, which, however, can only take place when the source of the sound is in a plane, or nearly so, with a line passing through both ears. Thus it is a common experience that a person in a house cannot, by the noise of an approaching carriage, judge with certainty whether it is coming from the right or left. He accurately judges it to be approaching, receding, or passing, as the case may be, by the gradations of loudness, but may have a feeling of uncertainty as to whether its approach or recession is from up or down the street. To produce the impression of distance the ventriloquist modifies the tones of his voice by varying the position of the tongue and the soft palate, dilating or contracting the mouth or pharynx, and either dividing the buccal and pharyngeal cavities into several compartments or throwing them into one. This is done without much movement of the lips and features, such slight movements as are absolutely necessary being concealed by turning the front face away from the audience, unless the latter are at a distance, and scarcely showing the whole of the profile. Great assistance is also obtained from the practice of indicating either directly or indirectly to the audience the direction in which the sound is supposed to be coming. Such appeals as "Are you up there?" "How did you get into the chimney?" &c., divert the attention of the hearer from the ventriloquist towards the place indicated, and the

attention of the former may also be diverted by means of skilful and natural gestures, such as looking, listening, or simply turning towards any point or object as if the sound was expected to come from thence.

**VEN'UE**, in law, signifies the place whence a jury are to come for trial of causes. Venue formerly was distinguished as *local* or *transitory*. In regard to the former, and with reference to actions relating to real estate, it was held that the place in which the subject-matter was situated must be laid as the venue in the action; but by the passing of the Judicature Act, local venue was abolished. Venue in criminal cases still exists, and is co-extensive with the jurisdiction of the court.

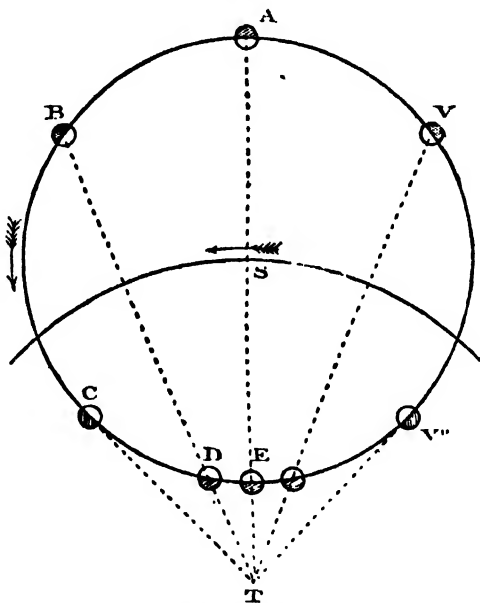
**VENUS** (the *e* is short in Latin, not long, as our accentuation would indicate), the Latin goddess whom the Romans, annexing the Greek mythology *en bloc*, forcibly identified with the Greek Aphrodītē, is now scarcely separable from the last-named goddess. The word *Venus*, no doubt, springs from the Aryan Root  $\sqrt{\text{WAN}}$ , Sanskrit *van*, to love and honour, and we might dimly surmise that she was the patroness of sexual love, like the beauty goddess Aphrodītē ("child of the foam of the sea," as her name literally means), did we not find ourselves confronted with three curious surnames of great antiquity. The oldest title seems to be *Venus Myrtea*, the myrtle-goddess; another is *Venus Cloacina*, the sewer-goddess; and a third, *Venus Calva*, the goddess of baldness. Of these the first, which gives the myrtle to Venus as her sacred tree, no doubt arises from some legend now utterly lost; the second probably means "the purifier," or cleanser; and the third refers to the lock of hair which the Roman bride sacrificed on her marriage. But the whole attributes taken together would certainly rather point to a marriage-goddess, guardian of family honour and purity, sweeper away of foulness of life, than to a goddess of sexual passion and animal beauty.

In the early times of Rome the worship of Venus was unimportant. The gods really honoured by the Romans were abstract qualities, *Fortuna*, *Concordia*, &c., rather than personal divinities about whom legends might be told. It was not until the conquest of Sicily that the Greek worship of Aphrodītē was identified with the little-honoured *Venus*, and imported to Rome as *Venus Erycina*, under which title a temple was erected to her on the capitol. The rapidly-growing taste of literature further elevated the newly-enlarged cult, for the passion of love, whose goddess Venus was now recognized to be, whatever her real attributes had previously been, is beyond all others the theme of poets. But a yet more powerful incitement to the honour of Venus lay in the legend of the descent of the Roman people from *Aeneas* (*Aincias*), the son whom Aphrodītē bore in Troy to Anchisēas. Venus being now Aphrodītē took over all the Greek Aphrodisiac myths, this among them, and as *Aeneas* was fabled to have come to Italy and founded the kingdom, gave birth to the kingdom of Rome. The great Julian gens or clan presumed to derive its name and itself from *Iulus* or *Julus*, the son of *Aeneas*, and when the Cæsars, who were the chief family of the Julian gens, rose to supremacy, the worship of their legendary goddess-ancestress assumed national proportions as, so to speak, she was the mother of the Roman people, and in especial of their emperor. The month of April was especially dedicated to Venus.

**VENUS.** We refer to **SOLAR SYSTEM** for a general account of the orbit of Venus as compared with the other planets revolving around the sun. With the exception of Mercury, and probably also of some one or more other planets which may be still closer to the sun, Venus is the nearest of all the planets to the great centre of our system. The actual path of Venus differs but little from a circle, of which the sun is the centre, and of which the radius is 67,500,000 miles. Owing, however, to the ellipticity of

the orbit the exact distance fluctuates a little on either side of its average value, but it is never more than 68,000,000 miles, nor less than 67,000,000. Around this path Venus sweeps in a period of 224 days 15 hours, at an average velocity of 22 miles a second. The velocity of the planet is, however, variable, and ranges between  $22\frac{1}{2}$  miles and  $21\frac{1}{2}$  miles a second. As the earth moves  $18\frac{1}{2}$  miles per second, we have here an illustration of the general law that the nearer planets are to the sun the greater is the velocity. In order to consider the circumstances under which Venus appears alternately as a morning and as an evening star, it is necessary to observe that the relative positions of the sun and of Venus, as seen from the earth, are the same as if the earth and the sun remained fixed while Venus revolved around the sun in a period of 584 days. We thus have a cycle of phenomena which run through their course in an average period of 584 days, and then begin again. Once during this cycle Venus attains its greatest brilliancy as an evening star, and then, about seventy-three days later, it is most brilliant as a morning star. These changes will

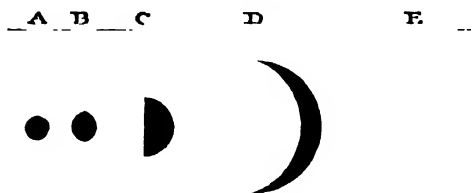
Fig. 1.



be explained by the two figures here given. *s* (fig. 1) is the centre of the sun, *t* is the earth, and *A, B, C* are the successive positions of Venus in its path around the sun. At *A* Venus is at its greatest distance from the earth, and turns a fully illuminated hemisphere towards the earth. It is therefore shown in the manner represented in *A* (fig. 2). In this case Venus is close in line with the sun, and from this cause, as well as from its minute size, it is unsuited for observation. As Venus approaches *B* (fig. 1) the distance, *BT*, becomes less, and consequently the apparent size of the planet increases; at the same time the fully illuminated disc is no longer towards the earth, and therefore the appearance presented is that in *B* (fig. 2). When Venus reaches *C* a critical position is attained. The angular distance between Venus and the sun has then its greatest value, and Venus is said to be at its greatest elongation, the angle in question being about 47 degrees. Half the illuminated disc is then turned towards the earth (*C*, fig. 2). The greatest brilliancy is, however, not yet attained. The apparent diameter of Venus is now rapidly increasing, and the apparent area of the brilliant surface thus continues to increase, although the shape is becoming more

and more crescent-like, until, about a month after the greatest elongation, the planet attains its position of greatest brilliancy at *D*. The disc then continues to increase, while the illuminated crescent becomes thinner, until at *K* the illuminated face is entirely averted from the earth, this being the condition in which a transit of Venus is sometimes observed. After passing this conjunction the same

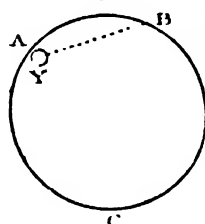
Fig. 2.



series of changes proceeds in a reverse order, until, after the interval of about 584 days, the position *A* is regained, and the changes commence again.

The transit of Venus, to which we have just referred, is very unfrequent, owing to the inclination of the plane of the orbit of Venus to the ecliptic. Unless the conjunction has been at the time when Venus is near one of the nodes of its orbit it will not be seen directly in front of the sun. It is, however, remarkable that the transits, unfrequent as they actually are, do occur in pairs, the two transits of each pair being separated by a period of eight years. This arises from the fact that eight revolutions of the earth are very nearly the same as thirteen revolutions of Venus; hence it follows that if the earth and Venus are in their correct relative position for a transit now, so will they be again in eight years' time. This relation is only approximately true, so that by the next eight years the line of

Fig. 3.

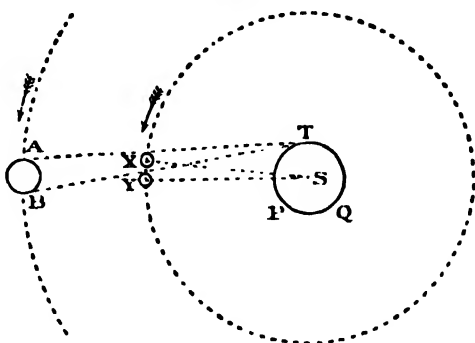


hours, according to circumstances, leaves the disc of the sun.

*Transit of Venus.*—Great importance has been attached to the transit of Venus, as by its means we have one of the best methods of finding the earth's distance from the sun. We must attempt to give here a brief account of the principles of this method, or perhaps we should rather say a sketch of how the observations do really enable the distance to be found, for the actual details of the matter are very intricate. We shall simplify the subject by supposing that the orbit of Venus coincides with the ecliptic. We shall also suppose that the orbits of the earth and of Venus are both circles. When the planet has just entered completely on the sun, as at *A* (fig. 3), the phase is said to be *first internal contact*. After passing across the face of the sun the planet reaches *B*, and when the circular edge of the planet just touches the circular edge of the sun the phase called *last internal contact* is reached. Observations of the transit of Venus are mainly devoted to the accurate determination of the time at which first internal contact and last internal contact occur. It is from these observations, made at different parts of the earth, that the parallax of the sun

is to be considered. Let *PQT* (fig. 4) denote the sun, of which *s* is the centre; let *AN* represent the earth. Draw *AT*, a common tangent to the sun and the earth, and also the common tangent *BT*, which touches the earth at *N* and the sun in a point so close to *T* as to be indistinguishable therefrom. The circle through *AN* is the orbit of the earth, and the circle through *xy* is the orbit of Venus. As Venus is moving faster than the earth, it follows that Venus will overtake the earth, and thus at a certain time will arrive at the position *x*. Remembering that we have assumed that the orbit of Venus lies in the same plane as that of the earth, it follows that an observer stationed at *A* will just see Venus at first internal contact, and having previously regulated his clock accurately, he will be able to note the moment when Venus is at *x*. After a certain interval

Fig. 4.



Venus will have moved to the position *y*, where it touches the second common tangent drawn to the earth and the sun; an observer stationed at *B* will therefore now see Venus at first internal contact. It is therefore clear that *A* is the spot where the internal contact is first seen, and *B* is the spot where it is last seen. Suppose, then, that expeditions are sent, if not actually to *A* and *B*, at all events to stations as close as geographical considerations will render suitable. We may also imagine that a telegraphic wire is laid from one station to the other, so that at the instant of contact as first seen at or near *A* a telegraphic signal is sent to *B*. The observer at or near *B* notes the arrival of this signal by his clock, and when he subsequently observes the contact at a time also indicated by his clock, he is able to ascertain the interval between the internal contact seen from *A* and that from *B*. This is, in fact, the actual time taken by Venus to move from *x* to *y*. But we know that Venus can travel completely round the sun *relatively to the earth* in about 584 days. Hence, assuming that Venus moves uniformly, we can compute the angle *x s y*. The radius *TS* is small compared with the distance *xs*, we may therefore, with sufficient accuracy for our present purpose, suppose that the angle *x T y* is equal to the angle *x s y*. The problem is thus solved, for the distance *AB*, being nearly equal to the diameter of the earth, is known, also the angle *ATB* is known, and thus the distance *AT* from the sun to the earth is determined.

It is hardly possible to overestimate the importance of an accurate knowledge of the sun's distance. With a single exception it is the unit in which the distances of the heavenly bodies are invariably expressed. The exception is the Moon. When once the distance of the sun from the earth is known, then from Kepler's third law the distances of all the planets are found. From this will follow the dimensions of the planets and of the orbits of their satellites. Thus, to determine the scale of the whole solar system, it is only necessary to determine the distance



of the sun from the earth. So also when we seek to determine the distances of the fixed stars from the earth, the quantity which the observations give is the angle which the radius of the earth's orbit subtends at the star. Hence it is that the transit of Venus has attracted an exceptional amount of attention, and both the recent transits have been most diligently observed by expeditions sent to occupy all the most eligible points on the globe. At the present time the distance of the sun is believed to be not less than 92,200,000 miles, and not greater than 92,700,000 miles. A closer approximation will perhaps be attainable when the results of the recent observations have been fully elaborated.

**VENUS' FLY-TRAP.** See *DIONÆA, INSECTIVOROUS PLANTS.*

**VENUS' GIRDLE** (*Cestum Veneris*) is a lowly organized marine animal belonging to the group *Ctenophora*. It has a flat ribbon-shaped body, excessively elongated laterally, attaining a length of 3 or 4 feet. The true axis of the body is quite in the centre of the ribbon; and in this position, at the margin, is placed the mouth, which is carried downwards. Around the mouth are two tactile forked filaments. There are four rows of vibratile cilia on the body, by means of which the creature swims with the greatest agility. The venus' girdle is very common in the Mediterranean.

**VENUS' HAIR STONE,** a variety of QUARTZ, or rock-crystal, inclosing needle-like crystals or fibres of RUTILE or ANASTOM. Examples of the first are obtained especially from Madagascar and Brazil, and a variety has been found at St. Gotthard, in which the needles of rutile form a network, sometimes named Cupid's Net.

**VENUS' LOOKING-GLASS** (*Specularia speculum*) is an annual herb belonging to the order *CAMPANULACEÆ*. It is found in corn-fields in the South of Europe, and is very commonly cultivated in gardens in this country. The flowers are of a beautiful shining blue-white or violet colour. The corolla is large, wheel-shaped, and five-lobed, exceeding the lobes of the calyx. The ovary and capsule are remarkably long and narrow, and triangular in shape. A nearly allied species is *Specularia hybrida*, which is found in corn-fields in the south of England, and occasionally in the north and in Scotland. It has blue flowers, the corolla being shorter than the calyx.

**VENUS, STATUES OF.** Statues of Aphrodité, goddess of beauty, whom the Latins called Venus, were to the artists of ancient Greece what pictures of the Madonna were to the age of Raffaele, a means of endeavouring to express the ineffable, to represent the unattainable, to realize the ideal of womanly form. But the Greeks as rarely aimed at the spiritual side of beauty as did the mediæval artists rarely neglect that side, and therein lies a difference simply inconceivable in amount. Nevertheless in at least three statues among the great multitude of Venuses, so great is the loveliness and so goddess-like the expression they show forth, that even at this dim reach of time they inspire the beholder with a reverential awe, and enable him for a few moments to feel, like Wordsworth, with

"The pagan suckled in a creed outworn,"

and lay aside his easy contempt for religious thought which is not akin to his own.

(1) *Venus of Melos.*—This is, on all hands, admitted to be the loveliest creation in the realms of art. It is one of the very few statues which antiquaries believe to be genuine antique originals, actual productions of the chisel of some Greek sculptor, dead for 2300 years. The exquisite unrivalled beauty of this statue has even permitted many enthusiasts to claim it for the Knidian Aphrodité herself, but the evidence of gems and literary allusions points far rather to the Capitoline Venus as a copy of that wonderful

original. Both arms are broken off, and many suggestions have been made as to their proper pose, the verdict being still doubtful. Fortunately the head is uninjured; the wavy hair, the faultless features are scarcely touched by the blurring finger of time. The lofty, calm Olympian gaze, away above and beyond all human pettinesses, embraces the worshipper now as of old. The drapery of the goddess has slipped to her waist and is caught by her bent knee, surrounding her with beautiful folds—and from this base of drapery rises the shapely nude form, pure and unconscious. The beauty of the statue is far from that of the wanton love-goddess of the Romans; rather is it of an almost star-like coldness and purity, yet so sweet as to be void of any suspicion of severity. This marble was broken in at least three pieces when it was found in 1820, in the island of Melos or Milo (whence its name). It was removed to Paris in 1884, and has ever since been the chief pride of the Louvre galleries.

The Aphrodité of Melos is an instance of the astounding accuracy with which a perfect artist unconsciously imitates nature: for exquisitely lovely as she is Professor Karl Hasse in 1887, by the most minutely exact measurements, succeeded in showing that the right and left halves of the face are not precisely alike. Below the nose all the features are strictly regular, but above that point all is irregular. The left ear stands higher up than the right; the left side of the face is also higher, and nearer to the middle line; the left half of the skull is broader than the right. Professor Hasse then measured many lovely and apparently perfect faces of beautiful living women, and found that the two halves of a face are practically never more in symmetry, and usually indeed far less regular, in actual life than in the sculptor's ideal.

(2) *Venus de' Medici.*—This fine statue, the work of Kleoménēs, son of Apollodōros of Athens, as an inscription on the base informs us, is of late Attic date, but is no doubt an original work. It is entirely nude, and in the attitude is far less purely modest than either the Louvre or the Capitoline Venus. Byron's description of the Medicean Venus, the principal ornament of the Uffizi gallery at Florence, is as accurate as it is beautiful—

"There, too, the goddess loves in stone, and fills  
The air around with beauty."

—"Child of Haro'd," iv. 49 and following stanzas.

It is the goddess of love, as the quick penetration of the great poet at once perceived, not so much the high-souled divinity of pure beauty, as the entrancing and fascinating conqueror of souls, that we have before us in this wondrous shape. The statue was found in eleven pieces in the portico of Octavia at Rome, but the whole figure was complete, except one arm alone, which was afterwards restored. The fine polish which gives almost life to the stone is of course a sign of the lateness and comparative decadence of the work, for it is unknown in the Pheidias era and that next succeeding. The head of the statue seems rather small for the body, but otherwise the form is faultless.

(3) *The Venus of the Capitol,* the glory of the Capitoline Museum at Rome, is believed to be the work of a Greek chisel, and to be a copy of the ever-famous statue by Praxitelēs, known as the Aphrodité of Knidos (Venus of Knidos), and so beloved by the men of that town that they refused the offer of Nikomédēs to discharge their entire public debt as its price. It was found built up in the wall of a house in the Suburra, the crowded district in the hollow between the Quirinal and the Esquiline hills in Old Rome, and was thus preserved in all its beauty. The statue is quite nude, but any unpleasant effect of nudity is escaped by the carelessly beautiful heap of drapery, just fallen—or one might almost say falling—from the goddess's hand as she unrobes for her bath, supplying at once the reason for her being unclothed, and the assurance that in another moment her fair form will be concealed by the waves. Assuming

the tradition of the Praxitelean origin of the statue to be true, it is an excellent example of the beauty, grace, tenderness, and exquisite refinement which, we are told by all antiquity, lent to this sculptor's works such a winning charm. The golden tint of the marble is indescribably lovely.

**VERA CRUZ**, a seaport in Mexico, is situated on the south-western shores of the southern part of the Gulf of Mexico. It is still one of the most important commercial towns of the republic, though it has properly speaking no harbour, but only a roadstead formed by several shoals, which inclose in a semicircular form a tract of sea. The fortress of San Juan de Ulloa is built about half a mile from the shore, on a rocky island, on which is also a lighthouse, showing a brilliant revolving light, 79 feet above the water. The tide ebbs and flows only once in twenty-four hours. The harbour is provided with a good stone mole, but it is very insecure, having neither good anchorage nor sufficient protection from the *Nortes*, which are terrible hurricanes, bearing along in their course clouds of sand from the hills behind the town. The anchorage is so very bad that no ship is considered safe unless made fast to brass rings fixed for the purpose in the castle walls.

Vera Cruz is built on a level and arid shore, consisting of sand, and almost entirely destitute of vegetation. Surrounding the town are marshes and sand-hills: the latter rise from 25 to 36 feet above their base, and are composed of sand so fine and loose that they change their form and position annually. The reflection of the solar rays from these hills is supposed to be one cause of the great heat during summer. Yellow fever is prevalent from May to November in one of its most virulent forms, and is then almost certain to attack newly-arrived strangers from other countries. The town, which is surrounded by strong walls, is well built in the old Moorish style. It is in the form of a semicircle facing the sea, from which it presents a very imposing and picturesque appearance. The streets are straight and wide; the paving is very good, and every road has a raised footway on each side, of a convenient breadth, and frequently under arcades. Many of the houses are excellent, and all are constructed of a porous white coral limestone, which composes the cliffs on the coast, and is usually found in large rounded masses. Besides the cathedral there are numerous churches. The other principal structures are—the government house, which is tolerably handsome, some splendid hotels and palaces, a few good hospitals, and several dilapidated monasteries, which, like most of its religious edifices, have been neglected or abandoned since the Spaniards were expelled from the town. Speaking generally, the public buildings are not remarkable for their beauty, but there are several fine squares. Rain-water is collected in tanks on the roofs of the houses, but the common people use the water brought by an aqueduct from the Laguna, a lake about 6 miles distant from the town.

Before 1820 Vera Cruz was the only port on the eastern coast of Mexico from which the produce of the country was exported, and by which foreign goods destined for the consumption of the interior reached their destination. But soon after 1820 the other ports of the country were thrown open to the foreign trade, and since that time many of its former exports, especially the produce of the northern mines, have found their way to other ports, particularly to Tampico, which is in a healthier situation, and has a better harbour. But notwithstanding its numerous disadvantages the commerce of Vera Cruz is still very considerable. The principal articles exported are bullion, cochineal, sugar, flour, indigo, drugs, vanilla, logwood, sarsaparilla, jalap, soap, and pimento; the imports are chiefly linen, cotton, woollen, and silk goods, paper, wine, brandy, cocoa, quicksilver, iron, cutlery, wax, earthenware, &c.

A line of railway has been constructed from Vera Cruz

into the interior of the country, and a tramway,  $2\frac{1}{2}$  miles in length, has been laid down from the station to the principal streets of the town.

Vera Cruz is situated about 185 miles east from Mexico, and contained in 1882 a population estimated at 24,000, including numerous foreigners from all parts of the civilized world. The full name of the city is *Villa Rica de la Vera Cruz* ("the rich city of the true cross"). It was founded in the latter part of the sixteenth century on the spot where Cortez first landed in 1519. Its castle, which completely commands it, was taken by the French in 1829, and by the Americans, after bombarding the town, in 1847. It was again captured by a French force on the 8th of December, 1861, and became the basis of the war operations which led to the establishment of the short-lived Mexican Empire. The Emperor Maximilian landed here on the 29th May, 1864, and his remains were conveyed hence to Austria in 1868.

**VERATRIC ACID**, an acid obtained from the seeds of *Sabadilla* (*Sagrua officinalis*, natural order Melanthaceæ). It is also found in White Hellebore (*Veratrum album*), and other plants of the same natural order. It crystallizes in four-sided prisms, having the formula  $C_9H_9O_4$ . It is soluble in boiling water and alcohol, but insoluble in ether. It dissolves in strong nitric acid, forming a crystalline conjugate acid called nitro-veratric acid,  $C_9H_9(NO_2)O_4$ . With the alkalis it forms crystalline soluble salts known as veratrates, having the general formula  $C_9H_9MO_4$ . It forms an ether called veratric ether or ethylic veratrate,  $C_9H_9(C_2H_5)O_4$ , which is a crystalline body soluble in alcohol.

**VERATRINE**, an alkaloid found associated with veratric acid in the *sabadilla* and white hellebore, from which it is obtained by dissolving it out with dilute sulphuric soda, and precipitating it from the solution by caustic soda. It is a white crystalline powder, having the formula  $C_{22}H_{25}N_2O_8$ . It is inodorous, but is remarkable for producing the most violent sneezing. Strong sulphuric acid colours it yellow, then crimson, and ultimately violet; strong nitric acid colours it first scarlet and then yellow; and strong hydrochloric acid dissolves it with a deep violet colour. These reactions serve to identify it, which is important, as it is extremely poisonous. It is, however, much employed in medicine, and is given internally in doses of one-seventieth to one-sixteenth of a grain as an antipyretic and sedative in fevers and acute inflammations; in larger doses it causes vomiting and purging. But its principal use is externally, in the form of ointment, for allaying the pain of neuralgia. In combination with acids it forms soluble crystalline salts. Veratrol ( $C_9H_{11}O_2$ ) is a colourless oil obtained from veratric acid by distilling it with baryta. It has an agreeable odour, a specific gravity of 1.086, and boils at  $205^{\circ}C$ . ( $401^{\circ}F$ ). It forms substitution compounds with nitric acid and bromine.

**VERATRUM** is a genus of plants belonging to the order LILIACEÆ. About eight or nine species are known, natives of Europe, Russian Asia, and North America. They are perennial herbs, with erect stems, ovate pointed leaves, and panicles of polygamous flowers. The perianth has six spreading segments connate at the base into a very short tube; the stamens are six, inserted into the base of the segments; and the fruit is a three-horned capsule. The species are remarkable for their powerfully acrid properties.

The White Hellebore (*Veratrum album*) is a native of alpine and subalpine districts in the southern and central parts of Europe; it is not found in Britain. The root-stock is collected in the Alps and Pyrenees for medicinal purposes. It is nearly devoid of odour, but has an acrid, bitter, burning taste. Its properties depend on the presence of an alkaloid, **VERATRINE**. In doses short of any dangerous or violent effect, white hellebore exercises a peculiar action on the secreting organs, the stomach and

intestines, and the nervous system. Almost all mucous surfaces, and the glands connected with them, as well as the kidneys, are excited to increased secretion. The medicinal employment of white hellebore is not very great in the present day; but when administered with due caution it is of great service in gouty and dyspeptic disorders, where there is torpor of the liver, sluggish bowels, and defective secretion from the kidneys. From its influence on these organs it often proves useful in chronic cutaneous diseases, in which the digestion is always impaired. It is likewise used as a sternutatory, largely diluted with some starchy powder. It is chiefly employed, however, at the present time in the form of a powder by gardeners to destroy the larvæ of noxious insects and other vermin. The American Hellebore or Indian Poke (*Veratrum viride*) is a North American species, common in the northern and central states of the Union. Its rootstock possesses properties very similar to those of white hellebore, and is used in pneumonia, peritonitis, and affections of the heart.

**VERB** (from the Latin *verbum*, a word). The various words which belong to a language have been distributed into classes, called the Parts of Speech, of which the verb is one of the principal.

The term verb comprehends those words in a language which are used to indicate the relations of mode or mood, which means manner, and the relations of time or tense. The relations of mood and tense are the essential characteristics of the verb. The mood is direct affirmation or negation, as indicative; or a way of giving a command, as imperative; or dependent or subjoined, as subjunctive; or indeterminate in itself, as infinitive. Tense refers to time present, past, or future. The verb is also characterized by indicating the relations of subject to subject, or subject to object, whether these relations are expressed by some part of the word called verb, or by some other words which are to be viewed in relation to the verb, in order to denote these relations of subject to subject or subject to object. Thus the Latin forms *amo*, I love; *lego*, I read, comprehend the relations of mode, time, and subject; and the phrases *amo puellam*, *lego librum*, comprehend also the relation of the subject to an object. Verbs contain the notion of an activity; but this activity may be either directed from a subject to an object, or remain in the subject; as "I love Elizabeth," or "I walk." The notion of an activity is expressed by a verb when the activity is contemplated as bearing the relations of person, time, and mood to the speaker: e.g. "he drank," "he fled," "the tree grows;" it is expressed by an adjective when it is not thus related to the speaker: e.g. "a drunken person," "a flighty thought," "a great tree." The notion of an existence, i.e. of a person or thing which really exists, or is conceived by the mind as existing, is expressed by a substantive: e.g. "a drinker," "a drink," "the flock," "the flight," "the growth."

• Some grammarians have desired to prove that all roots are verbs, and all radical notions are notions of activity; that all substantives as well as adjectives are derived from verbs, that is, from a root which is a notion of activity; and all notions expressed by substantives are notions of activity transformed into notions of existence. On the contrary, words when reduced to their simplest forms, that is, to their roots, are neither verbs, nor nouns, nor adjectives; they are roots. The discussion whether the noun or the verb should be considered nearest the root, in cases where both contain a common element, is a discussion about nothing at all. The element may exist in a somewhat varied form in the noun and in the verb, and the variations in each case can be referred to a particular class of verb and noun. But as a matter of fact, while there are few nouns derived from verbs, there are hundreds of verbs derived from nouns. Thus from *man*, *dog*, *eye*, *sail*,

we get "to man," "to dog," "to eye," "to sail," and so in countless other cases. There is a great and growing tendency to differentiate these in accent. One very marked way is to accent the verb on the final syllable, the noun on an earlier syllable: thus we "record" a record," we "present" a present," we "envelope in an envelope." In other cases we pronounce the noun lightly, the verb heavily:—thus "we advise when we give advice," we "use a thing which is of use," we "strive our strife," we "breathe our breath."

When the characteristic marks of verb, adjective, and noun are taken away, there remains the root, which in itself has no grammatical name as opposed to any other kind of word. Roots may be classified, like grammatical words, but they are still roots and nothing more. The only difficulty that may be suggested as to this explanation is that the root and the noun may be identical in form, as in many instances in our own language, such as "man," "dog," &c. But though these words in themselves suggest a notion of something intelligible, they are not nouns, unless they are used as parts of speech. It is only when we view words as the constituent parts of language that we give them grammatical names.

The division of verbs into Active, Passive, and Neuter, is founded on the notion of a verb expressing doing, suffering, and a condition. But this division is objectionable, because it introduces considerations foreign to the subject of grammar: it involves a metaphysical question. The division of verbs into Transitive and Intransitive is a grammatical division, and is useful. A verb is transitive when it has an object which is not the subject, as "I blame John." A verb is intransitive when the subject of the verb is the object of the notion of the verb. Intransitive verbs, therefore, considered as grammatical forms, comprise what are called Neuter Verbs and Passive Verbs. Viewed with reference to predication, that is, of the intransitive verb which is called the neuter, as "I walk," differs from what is called the passive, as "I am loved," merely in this, the neuter implies nothing external to the "I," which is the object of its own energy; the passive implies something external to the subject, of which external thing the subject is an object. Consequently it is only another mode of expressing the notion of the transitive verb. The peculiar form which this so-called passive voice has, depends on the character of each language. The so-called Reflective Verb is in form either a transitive verb, when the subject is also expressed as its own object, or a passive verb, in which the implied external thing is identical with the subject.

The peculiar characters of verbs in any given language form an important part of the study of that language. We have said that mood and tense are the characteristics of a verb; but it is not necessary that the words which denote mood and tense should be attached to the root for the purpose of making a verb. The English language contains cases where the words expressing mood and tense are quite distinct from the root, which their relations to it convert into the quality of verb. Whether such modifying words shall be attached to the root or not, is an accident of language, not an essential. There may be other adjuncts to the root besides mood and tense, and these adjuncts may, according to the character of a language, be either attached to the root, or detached from it, though related to it.

In English the most remarkable antiquities of the tongue are all preserved in the verb. The nouns are worn out of all knowledge, but a class of verbs, called *strong verbs*, have preserved to us many features of the ancient speech of our first ancestors. Herein we trace our similitude with Gothic and Teutonic forms; and the philologist regrets only that the class is so limited. These are the verbs, "begin, began, begun," "sing, sang, sung," &c., which express inflexion by alteration of the vowel, instead of by the addition of *d* or *ed* for the past tense, and also the

participle, as "love, loved, am loved," "defend, defended, am defended," &c., to which class the immense bulk of English verbs belongs. Unfortunately, many words long reckoned among the strong verbs are now becoming altered towards the weak form, as "leap, leaped or leapt," "bend, bended or bent," so "blended or blent," "learned or learnt," "spilled or spilt," &c.

**VERBASCUM** is a genus of plants belonging to the order SCROPHULARIACEÆ. The species are about 100, widely distributed over Europe, Northern Africa, and Western and Central Asia; six are natives of Britain. The species are tall, erect, stiff herbs, usually biennial, and frequently covered with thick wool. The leaves are coarse, alternate, more or less toothed. The flowers are yellow, white, or rarely purple, with a deeply five-cleft calyx; the corolla is wheel-shaped or concave, with a very short tube, and five broad lobes; the stamens are five. The fruit is a globular or egg-shaped capsule, opening at the partition in two valves. The Great Mullein (*Verbascum Thapsus*) is a native of waste sterile places, especially of chalky and gravelly soils in Britain and throughout Europe. It is also found in Siberia, the Taurus, Caucasus, and the Himalayas. The leaves are remarkable for their woolly character. This plant was formerly much used in medicine, in cases of chronic catarrh and other affections of the chest, in the form of infusion or decoction of the leaves. It is also used in diseases of the lungs in cattle. The woolly leaves are said to have been used by the Greeks as wicks for lamps. The Romans called the plant *Candelaria*, and used its stalks, dipped in suet, to burn at funerals. It grows to a height of from 2 to 4 feet, and has yellow flowers in a dense woolly terminal spike. The Moth Mullein (*Verbascum blattaria*) is a native of the middle and south of Europe, and some parts of Asia. It is not a common plant in Great Britain, although in some places it is abundant; it has probably been introduced from the Continent. It is called *Blattaria*, because it is said to drive away the blatta or cockroach.

**VERBENA** is a genus of plants, the type of the order VERBENACEÆ. About eighty species are known, chiefly from the tropical and subtropical parts of America. One species, *Verbena officinalis*, is a native of Britain, and is widely distributed in the warmer and temperate parts of the world. The species are herbs or small shrubs, with opposite, often much divided leaves, and sessile flowers, furnished with bracts, in spikes or in a flat cluster which elongates after flowering. The calyx is tubular and five-toothed; the corolla is tubular, with a spreading limb, sometimes unequally five-cleft; there are four stamens included within the corolla. The fruit when ripe splits into four single-seeded nutlets.

The only British species is the Common Vervain (*Verbena officinalis*), which is found growing on roadsides and in waste places. It is common in the southern counties of England, rare in the north of England and in Ireland, and unknown in Scotland. It was formerly held in high repute by the mediæval herbalists as a medicinal plant, being used as a remedy for stone, and the flowers for defective vision. It was also worn about the person to ward off blasts, and to secure good luck. All these virtues are now regarded as imaginary. It is a perennial herb, with an erect, somewhat hispid stem, growing to a height of 1 or 2 feet, rough, ovate or oblong, coarsely toothed or cut leaves, and long slender spikes of very small pale purple flowers.

Garden verbenas are among the most popular of garden flowers, and a large number of varieties have been established by crossing the native and introduced species. *Verbena chamoedrifolia*, a beautiful species with scarlet blossoms, was introduced into England from Buenos Ayres in 1825. These garden plants are easily propagated, grow rapidly and provide a brilliant display of blossom all through

the summer. The Sweet-scented or Lemon-scented *Verbena* (*Lippia citriodora*), belonging to a nearly allied genus, is a small shrub, a native of Chili, cultivated in gardens for its fragrance, due to a volatile oil contained in the leaves. It has small slender spikes of bluish-white flowers.

**VERBENACEÆ**, an order of plants belonging to the group Gamopetalæ, cohort Lamiales. [See BOTANY.] About 700 species are known. This order is rare in Europe, in the north of Asia, and in the north of America; they are common in the tropics of both hemispheres, and in the temperate districts of South America. In temperate regions the species belonging to the order are herbs, but in tropical climates they are shrubs and gigantic trees. The leaves are opposite or whorled, simple or compound, exstipulate. The flowers are hermaphrodite and irregular, arranged in spikes, heads, panicles, or cymes, and usually furnished with bracts. The calyx is inferior, persistent, tubular, with the limb usually four or five partite or toothed. The corolla is hypogynous, tubular, with the limb four or five-lobed, irregular and labiate. The stamens are inserted on the corolla, and are usually four, of which two are the longest (didynamous), or only two. The ovary is free, composed of two to four carpels, and containing from two to eight cells, with one or two ovules in each cell; the style is terminal and simple. The fruit is a drupe or a berry.

Bitter and astringent principles predominate in this order. The Vervain (*Verbena officinalis*) was formerly used as a tonic. [See VERBENA.] Species of *Lantana* are used as tea in Brazil, and their fruits are edible. TEAK is a valuable timber wood produced by *Tectona grandis*. Some species of Verbenaceæ are cultivated as ornamental plants.

**VERD ISLANDS, CAPE.** See CAPE VERD ISLANDS.

**VER'DE ANTICO** or **VERD ANTIQUE**, a fine green marble, or rather a green mottled serpentine, valuable for its fine markings, and much used by the designers of chapels, shrines, &c., in mediæval times. The more brilliant malachite has now displaced it, but the change is by no means an absolute improvement, as verde antico blends much better with other coloured marbles and costly stones, in panelling, &c., than does malachite.

**VER'DE AZUR'RO**, native carbonate of copper, green-turquoise in tint. Pliny's "Armenian Stone," used as a green-turquoise pigment by painters.

*Verde Eterno*, a favourite Venetian pigment, was another thing altogether; this was a fine dark green.

**VER'DI, GIUSEPPE**, the foremost Italian musical composer of the latter half of the nineteenth century, was born on 10th October, 1813, at Le Roncole, a little village near Busseto, in the duchy of Parma. His father was an innkeeper. In 1826 he began his career as a composer, but did not become generally known till 1839, when he produced his grand opera, "Uberto di San Bonifacio," at the Scala in Milan. His only comic opera, "Il Finto Stanislao," was brought out in 1840. After this nothing of his appeared till 1842, when "Nabuccodonosor" was given with great success, and very widely extended his fame. It was reproduced in London under the name of "Nino," and afterwards under the name of "Zora," the title being changed on account of English scruples against the introduction of a biblical character upon the stage. "I Lombardi," of which little is known in England besides the immensely popular romance "La mia Letitia," was brought out in 1843. All these were first performed in Milan, but Verdi was now engaged to compose for Venice, where in 1844 he produced "Ernani" (the libretto adapted from Victor Hugo's "Hernani"). This opera was played at Her Majesty's Theatre in the following year, it being the first complete work of the composer that was given in London, and its reception at once stamped the great popularity of Verdi in this country, which every succeeding

production has served to augment. "I Due Foscari" (a drama adapted from Byron's tragedy) was first played in 1845 at Rome. In 1846 he gave "Giovanna d'Arco" at Milan, "Alzira" at Naples, and "Attila" at Venice. Scarcely less fruitful was 1847, during which year he brought out "Macbeth" (adapted from Shakespeare) at Florence; "I Masnadieri" (adapted from "Die Räuber" of Schiller) at Her Majesty's Theatre in London; and "Jerusalem," a French version, with slight modifications and additions, of "I Lombardi," at the Académie Royale in Paris. From Paris he went in 1848 to Trieste, to bring out "Il Corsaro," and thence to Rome, where was performed "La Battaglia di Legnano," afterwards entitled "L'Assedio di Arlem." "Luisa Miller" (adapted from Schiller's "Kabale und Liebe") was first played at Naples in 1849. In 1850 "Stiffelio" was produced at Milan, with little success as compared with Verdi's other operas. He made ample amends to his reputation with "Rigoletto" (adapted from "Le Roi s'amuse" of Hugo), which was given in Venice in 1851; in 1853 it was played in London, and has kept the stage here ever since. Still more brilliant and still more extended has been the success of "Il Trovatore" (adapted from a Spanish tragedy of Antonio Garcia Gutierrez), which was produced at Rome in 1852. "La Traviata" (adapted from "La Dame aux Camélias" of A. Dumas, jun.) has had, in this country at least, a success scarcely inferior to that of the two previous operas. In 1853 "Stiffelio" was reproduced at Florence with some trifling changes, under the name of "Aroldo," and after this Verdi came not again before the public until 1855, when he brought out an original French opera, "Les Vêpres Siciliennes," at the Académie Impériale, being present in Paris to superintend its rehearsals. In 1856 "Simone Boccanegra" was given with little effect at Venice. "Un Ballo in Maschera" (adapted from Scribe's "Gustave III.") As set by Auber) was Verdi's next opera. The reception of this work in Italy was without parallel in dramatic history. The immense enthusiasm it excited was, however, due in great measure to the political circumstances of the time. Verdi, who had become an active politician, was chosen a member of the first Italian Parliament, the distraction of which occupation estranged him for a while from the pursuit of his art. Further, his name, curiously enough, gave the initials of Vittorio Emanuele Re d'Italia; so that *Vera Verdi* was to the Italian patriot like a punning toast to a Jacobite under the Georges. After four years he accepted an engagement to compose "La Forza del Destino" for St. Petersburg, whither he went at the commencement of 1862 to direct its production. For this work the composer received the unprecedented sum of £6000. The commissioners of the London International Exhibition of 1862 requested Verdi, as the representative of musical Italy, to compose an instrumental work for their inaugural ceremony. He offered to write a cantata instead, and the commissioners accepted his proposal. It came too late, however, but was produced with success at Her Majesty's Theatre three weeks after.

Among Verdi's later works are "Don Carlos" (Paris, 1867); "Giovanna d'Azzo" (1868); "Aida" (1872), written for the Khedive Ismail of Egypt, and first played at Cairo; and his fine "Requiem Mass" for the patriot Manzoni, first performed in 1874 in the Church of San Marco at Milan, and afterwards produced by Verdi himself at London. Since that he has only produced "Montezuma" (1878), which was not very successful; and "Otello" (1887), which created a *furor* on its appearance at Milan, and for which Verdi received £8000. Though not equal to some of his other operas, it is full of fire, and is a remarkable production for a man of seventy-three. Verdi has earned his great popularity by his emphatic original melodies, with their characteristic but unsought harmony; by his powerful embodiment of dramatic situations; by his novel and

effective manner of treating the voice; and by the scope his music affords the singer of impassioned declamation. But even his best works are defaced by a considerable proportion of vapid writing. In his earlier operas he wrote in the Rossinian school, though always with originality and freedom from slavish copying of his great model. Later, however, he left this school for a style much more nearly like that of Wagner—serious, connected, and large in phrasing. "Aida," written after this change, is probably his best, though far from his most popular work. Verdi is a commander of the Legion of Honour, a foreign associate of the Académie des Beaux Arts, a grand officer of the Order of the Crown of Italy, and a grand cross of the Russian Order of Stanislaus and of the Turkish Order of the Osmanli. By a decree in November, 1874, he was made an Italian senator and head of the Italian Academy. In 1887 M. Pongin produced an excellent life of Verdi, free from trivial gossip, but full of genial anecdotes. One of them, which, however, was previously known to musical men, is the following:—When "Rigoletto" was in rehearsal, the tenor Mirate, cast for the part of the Duke of Mantua, perceived that a piece which he had to sing alone was wanting in his part. "*Mi manca un pezzo*" ("There is a piece missing"), said he to the composer. "*C'è tempo, te lo darò*" ("There is plenty of time; I will give it you"), replied the latter. The evening before the orchestral rehearsal Verdi brought a paper on which was the famous *canzone*, "La donna è mobile." "Mirate," then said Verdi, "you give me your word of honour that you will not sing this melody at home, that you will not hum it, that you will not even whistle it—in a word, that you will allow no one whatever to hear it." The master counted much, and with reason, on the effect of this *canzone*, of so new a rhythm, and so full of elegant ease. He knew, besides, that it was of a melodic turn easy to retain, and being aware of the powers of the Italians in this respect, he feared not only lest they should carry off his melody, but lest they should spread it abroad in Venice before the performance, and thus when it was heard in the theatre every one should accuse him of plagiarism, instead of applauding his invention. The day of the full rehearsal he addressed not only the orchestra, but the whole of the staff of the theatre, begging each person to keep it the most profound secret. The secret was well kept, and the effect of the song was prodigious.

Verdi is extremely modest and retiring, even to shyness; often refusing to attend meetings where he fears to be especially distinguished. In the winter he lives in his fine Geneva mansion, the Palazzo Doria, but all the rest of the year farms his little estate of Sant' Agata, near his native Busseto.

**VERDIGRIS**, as a pigment used by artists, is simply a bright acetate of copper. For an account of the cupric acetates, to which it belongs, see COPPER.

**VERDITER**, a pigment used in painting, of two shades, green and blue. It is hydrated percarbonate of copper, and is usually prepared by decomposing the solution of nitrate of copper by the addition of chalk. One variety, known as "Bremen Green," is produced by subjecting copper to the action of sea salt and oil of vitriol for many weeks together.

**VERDUN**, a town of France, in the department of the Meuse, situated on the left bank of the Meuse. It is a strong fortress on the German frontier, and gave the invaders much trouble in the Franco-German War of 1870. It has a cathedral, museum, and military prison, and is noted for its sugar plums and liqueurs. The population in 1886 was 12,964. The celebrated treaty of Verdun, dividing the Empire of Charlemagne in 843, derives its name from this town. In the great war of the beginning of the century, from the number of *détenus*, it was more than half English, with English shops "from London."



**VERGE-BOARD**, in architecture, is the external gable-board of a house, which, especially in later Tudor and Elizabethan architecture, was often most beautifully waved and carved. "Verge" originally meant always a rod, Latin *virga*, French *verge*; hence it came to mean a thin ring of iron rod or wooden lath—a hoop, in fact—and hence easily an edge. The two senses are exemplified frequently in Shakespeare. Thus, for example:—

"O would to God that the inclusive verge  
Of golden metal that must round my brow  
Were red-hot steel, to sear me to the brain."  
—*Richard III.* iv. 1.

and,

"Nature in you stands on the very verge  
Of her confine."—*Leary*, ii. 4.

Verge-board is of course used in the sense of edging-board. It was some years since curiously corrupted into "barge-board."

The verge-boards of Elizabethan English houses, very fine as they often are, are nowise comparable in elaborateness to those of the essentially wooden architecture of Switzerland, Tyrol, &c. Here the lavish carving and ornament are often almost too richly displayed for taste.

**VER'GERS**, attendants in the law-courts or in cathedrals, &c., who carry rods of office (Fr. *verges*, rods) before the great officials, judges, deans, archbishops, &c.

**VER'GIL, POLYDORÉ** (*Polidoro Vergilio*), was a native of Urbino in Italy, where he was born about the year 1470. Previous to his coming to England, where he resided many years, he had made himself known as an author—having published a collection of "Adagia," or proverbs, in 1498; and in 1499 another work, "De Rerum Inventoribus," which afterwards, in an enlarged form, passed through various editions. Being in the priesthood, Polydore Vergil was sent to England before 1503 by Pope Alexander VI. to collect the Peter-pence tax. Shortly after his arrival he obtained a living in Leicestershire, and was appointed archdeacon of Wells in 1507—receiving, besides, other church preferment. It was during his sojourn in this country that he wrote his principal work, the "Historia Anglica," a history of England from the earliest times to the end of the reign of Henry VII., the first edition of which was published at Basel in 1534. As a Latin historian, Polydore Vergil stands high for style and general lucidity; but the verdict usually passed upon his treatise is without doubt a just one, that it is more elegant than faithful. Having left England in 1550, he returned to Urbino, where he died in 1555.

**VERGIL'US** (or **VIRGILIUS**) **MARO, PUBLIUS** (sometimes called *Vergil*), the greatest of Latin poets. See **VIRGIL**.

**VERGLAS' or GLAZED FROST** (sometimes called *Silver Thaw*) is a phenomenon not very rare in Paris and elsewhere abroad, but hardly known in England. The German name for it is *Glattis*. It occurs when a sudden thaw has set in, and a warm wind plays over the still almost freezing ground. The result is that the wind is rapidly chilled, deposits its moisture, and covers the whole ground with a sheet of ice. As a little rain often falls at the time, the sheet is frequently of moderate substance, and becomes intensely dangerous on slopes of steep streets, &c. The difference between hoar-frost (frozen dew) and verglas is thus one of kind, though the two are sometimes erroneously spoken of as varieties of the same phenomenon. Verglas from falling rain, freezing as it lodges on boughs of trees, &c., so that the weight breaks and crushes them, sometimes does great damage in France. A particular case in 1879 caused damage of thousands of pounds in value round Paris by breaking down trees, &c.

**VERGNAUD, PIERRE VICTORIN**, a celebrated orator, and one of the leaders of the Girondist party, was

born at Limoges in 1759. His father was an advocate, and he himself was of the same profession, which he followed at Bordeaux, where he was leader of the bar. In 1791 he was elected deputy to the Legislative Assembly by the department of the Gironde. At first Vergniaud was devoted to ease and pleasure; but he soon shook off his sloth, and became the head of his party in eloquence and vigour. In the first sittings of the Legislative Assembly he signalized himself by the violence of his attacks on monarchy; he also seconded the motions of Couthon and Chabot, that the words "sire" and "majesté" should be abolished. He proposed the confiscation of the goods and suppression of the possessions and rights of the *émigrés*, and denounced the priesthood. Among the ultra-Girondists he was one of the most ardent and eloquent, but he was hated by the Jacobins, who suspected him of being in secret communication with the king. Vergniaud has also been falsely accused of having demanded large sums for the monarch, but on all occasions his conduct seems to have been disinterested. He defended the king in the debates which took place before his trial, and that event inspired him with his most brilliant eloquence. Nevertheless he voted for the king's death, presided over the assembly on the day of his condemnation, and pronounced sentence upon him. When the Girondist party was overthrown by the Jacobins, Vergniaud, with other members of his party, was tried and sentenced to death. He was executed on the 31st of October, 1793, aged thirty-five.

**VER'MES** (Worms). Linnaeus adopted this term as the title of a class, including all the lower invertebrated animals. The term is altogether discarded at the present by some systematists. Others, however, retain it as a general term for a number of more or less isolated groups of Invertebrata. The Vermes, therefore, do not form a natural division of the animal kingdom like the Mollusca or the Echinodermata, and cannot be said to present any well-marked common characters. Under this head are collected the groups **PLATYELMINTHA**, **NEMATHELMINTHA** (Nematoda and Acanthocephala), **ANNELIDA**, **Gephyrea**, **ROTIFERA**, **ENTEROPNEUSTA** (Balanoglossus), and **Chaetognatha** (**SAGITTATA**).

**VERMIFORM** (Lat. *vermis*, a worm, and *forma*, a shape), in anatomy, a term applied to certain convoluted and worm-shaped parts, as to a portion of the upper and under surfaces of the cerebellum, and to the prolongation of the intestinum cæcum. See **CÆCUM**, article and illustration.

**VERM'GLI**. See **MARTYR, PETER**.

**VERMIL'ION**, a fine scarlet colour extensively employed in painting and in the manufacture of red sealing-wax. It is mercuric sulphide ( $Hg_2S$ ), and contains 86·3 per cent. of mercury and 13·7 per cent. of sulphur. It occurs native as cinnabar, which is nearly pure, containing from 78 to 86 per cent. of mercury, and is the most important ore of that metal. Vermilion is usually manufactured for commercial use by direct combination of mercury and sulphur. There are two important methods of manufacture, known as the wet and dry processes. When made in this country by either process it always has a tinge of yellow, but that made in China, which secures a much higher price, is pure scarlet. By the dry method six parts of mercury are added to one part of melted sulphur, and the mixture heated and stirred; when the sulphur thickens, the combination ensues immediately, and is attended with light and heat and intumescence. The compound, when cooled, presents the appearance of a black mass with a reddish fracture. It is powdered and mixed with a small quantity of sulphur, and sublimed at a red heat in a glass flask inserted in a sand-bath. The excess of sulphur escapes, and the impurities remain on the bottom of the flask.

In the wet way, according to the old Dutch method, the

mercury is gradually added to the melted sulphur in the proportion of seventeen parts of mercury to five parts of sulphur, and the mixture stirred with an iron spoon, and then poured out on an iron plate and allowed to cool. It is then put into jars containing water; the moist cinnabar is transferred to earthen cylinders about 4 feet high, which are closed at the bottom and inserted into a sand-bath, where they are exposed to a red heat. The excess of sulphur burns off. The cylinders are then covered with iron plates, on the under side of which the pure cinnabar collects as a sublimate, and from which it is removed. It is then very finely ground with water, the brilliancy of the colour depending upon the fineness of the grinding. In China four parts of mercury and one part of sulphur are sublimed together in a common earthen vessel, to which an iron cover is attached. The earthen vessel is broken up on cooling, the pure cinnabar picked out, powdered and sifted into a large vessel of water; this is poured off, and the process of washing repeated several times; the vermilion remains at the bottom, and is taken out and dried. The colour of vermilion is much deteriorated if any black sulphide is mixed up with it. When white precipitate or amidechloride of mercury is treated with sulphide of ammonium, and heated gently, the black sulphide first formed becomes reddish-brown, and lastly assumes the deep red of vermilion. Digesting with caustic potash at a gentle heat improves the colour of vermilion. Vermilion is often adulterated; brickdust and oxide of iron remain behind on ignition. Red lead also remains as a fused oxide, and yields lead chloride on boiling with hydrochloric acid. Dragon's blood may be dissolved out by alcohol. Mercuric biniodide is a still more beautiful red colour, but it is more fugitive. It is sometimes known as Chinese vermilion.

**VERMONT**, one of the United States of North America, in the northern part of the Union, is about 80 miles distant from the Atlantic, from which it is divided by New Hampshire and Maine. It is bounded N. by the parallel of 45° N. lat., separating it from Canada, E. by New Hampshire, S. by Massachusetts, and W. by New York, from which Lake Champlain divides it for 100 miles. The greatest length south to north is 157 miles; the breadth varies from 30 to 85 miles. The area is 9135 square miles. The population in 1880 was 332,286. The inhabitants, like those of the other New England states, are mainly of English descent.

*Surface, Soil, &c.*—Vermont constitutes a part of the irregular mountain region which extends over most of that portion of the United States lying east of the river Hudson and of Lake Champlain. The surface is very uneven, and much of it is mountainous. The Green Mountains traverse the state from south to north, and divide it into nearly equal portions. They rise near Bennington, at about 42° 50' N. lat., and form one continuous ridge as far as about 41° N. lat., the width of which varies from 8 to 10 miles, and the length is about 75 miles. The slopes are rather gentle, but more so on the east than on the west, where in many places they are steep. In general they do not rise to more than 2000 or 2500 feet above the level of the sea, on a base which on the west may be 300 feet, and on the east 500 feet in elevation. Killington Peak, near Rutland, is 3675 feet above the sea. The summits of the mountains are rocky, and only covered with a spongy green moss, while the sides are often clothed with forests of evergreen trees, especially pine, spruce, and hemlock, from which it is supposed the name of the range is derived. The country surrounding this portion of the Green Mountains on the south is of indifferent quality. The soil is chiefly stony and gravelly, but as it is well drained, it is used as pasture ground, especially for sheep. A great extent is still covered with timber trees. In proceeding northward the land improves.

At about 44° N. lat. the southern ridge of the Green Mountains, spreading out to the east and west, becomes about 20 miles wide, and is here intersected by a depression, through which the Onion River flows to Lake Champlain. On the south side of the Onion River is the Camel's Rump, 4188 feet high; on the north side of the river is Mount Mansfield, 4359 feet high. Further to the north the Green Mountains extend between Richmond and Danville to a width of about 40 miles.

North of 44° 40' the mountain region narrows to about 20 miles, and its sides are inclosed by two uninterrupted ridges, of which the western, occupying about the middle of the state, runs nearly due north into Canada, where it terminates not far from the banks of the St. Francis River, about 45° 25' N. lat. The eastern ridge runs north by east a few miles from the banks of the Connecticut, enters Canada near the commencement of that river, and terminates at the sources of the St. John of New Brunswick. Both ridges attain an elevation of 2000 to 2500 feet above the sea-level. The tract inclosed by them is much inferior in fertility to the region further south.

The most fertile part of Vermont is that which lies on the banks of Lake Champlain, and may be called a plain, though the surface is broken by numerous water-courses. This plain is about 100 miles long, and in its southern districts less than 10 miles wide, but towards the north it widens to 30 miles. The soil varies greatly, but a large portion of it is productive. The greater portion of the state is of primary formation, though the valleys of the rivers are mostly alluvium, and the shores of Lake Champlain transition formation. On the western side of the mountains the rocks are principally old red sandstone, graywacke limestone, calciferous sandstone, and granular quartz, containing iron ore and manganese; hornblende, mica slate, granite, and gneiss form the body of the hills; serpentine occurs both in the southern and northern part of the state. Along the Connecticut is a continuous bed of clay slate. There is an extensive deposit of primitive limestone in Caledonia county. The eastern slope of the mountains is composed mostly of hornblende rock, gneiss, granite, and clay slate. Along the western part of the state a great belt of quartz is covered by a bed of crystalline limestone 2000 feet thick.

Vermont abounds in picturesque and sublime landscapes, and has some beautiful waterfalls, including the Great Falls on the Lamoile, with a descent of 150 feet, the Falls of the Clyde, and Bellow's Falls on the Connecticut. Lake Willoughby, north of St. Johnsbury, is becoming a fashionable resort on account of its attractive scenery.

*Rivers and Lakes.*—The state is studded with small lakes, and is altogether well watered, though there are no large rivers with their courses entirely within its boundaries. More than two-thirds of the drainage runs into Lake Champlain. [See CHAMPLAIN LAKE.] The largest rivers falling into that lake are Otter Creek, Onion River, the Lamoile, and the Missisqui, of which, however, only the first and last are navigable. A few small rivers which drain the northern district of the mountain region fall into Lake Memphremagog, which belongs to Canada, but about one-fifth lies within Vermont. This lake is nearly 30 miles long, but in no part exceeds 4 miles in width.

The river Connecticut runs between Vermont and New Hampshire for about 170 miles, but is not navigable in the upper part of its course, where it presents a continual succession of rapids and cataracts. All the streams falling into the Connecticut from the Green Mountains are small, and none of them navigable.

*Climate.*—Vermont is distinguished by the length and severity of its winter, which are beyond what could be expected from either latitude or elevation, yet it is one of the healthiest states in the Union. The excessive cold must be attributed to the north and north-west winds that pre-

vail in the winter, and which, before reaching this state, pass over the wide plain of Canada, where their force is not broken nor their intensity moderated by any range of hills. The frost continues almost without interruption from early in December to the beginning of April, and is very intense. The snow lies from the middle of December to the middle of March, and is often from 4 to 6 feet deep on the hill sides. In summer, from June to August inclusive, rain is scarce, and the heat in the middle of the day is oppressive. The most pleasant season here is from the beginning of September to the middle of October, the heat being then moderate and the air dry, elastic, and invigorating. The extremes of temperature are 17° below zero and 92° above.

**Products, Commerce, &c.**—In proportion to its population Vermont produces more wool, live stock, maple sugar, butter, cheese, hay, hops, and potatoes than any other state in the Union; in addition to large quantities of Indian corn, oats, wheat, rye, barley, pease, beans, fruit, including very superior apples, grass seeds, bees-wax, honey, tobacco, wine, molasses, and silk cocoons. Besides the forests of hemlock, fir, and spruce on the mountains, the oak, pine, hickory, sugar maple, elm, butter-nut, beech, basswood, and birch grow on the lower tracts, and cedars in the swamps. The animals include bears, black cats, wild cats, deer, foxes, hares, martens, ermines, porcupines, raccoons, skunks, several kinds of squirrels, weasels, and wolves. In the rivers and lakes are beavers, musk-rats, and otters. The Connecticut was once famous for its abundance of salmon, but they have disappeared; shad, however, are still taken. Vermont possesses many valuable minerals. Iron is found in abundance—bog ore throughout the state, but the best ores of the Tertiary age are along the western base of the Green Mountains. A bed of brown coal, in connection with iron, exists in Brandon. Vast quantities of coppers are made from iron pyrites or sulphuret of iron. Of other metals there are titanium, oxide of manganese, lead, magnetic iron ore, plumbago, copper, and zinc. Granite suitable for building and vast beds of fine marble are found. The marble quarries at Middlebury are particularly celebrated. A black variety of this beautiful building material is extensively quarried at Swanton, on Lake Champlain. A fine oilstone is manufactured into bones from a small island in Lake Memphremagog. Slate quarries are worked on the Connecticut. Kaolin (porcelain clay) of excellent quality, soapstone, limestone, steatite (in great abundance in Grafton, where it is largely quarried), talc, and marl all exist in this state. Fine white marble is found all along the base of the Green Mountains for 50 miles above and below Rutland, at which town an extensive trade is carried on in this article. Manganese and slate are mined and quarried in the same vicinity. Agriculture being the occupation of the majority of the inhabitants, the population of Vermont is not so extensively engaged in manufactures as most of the other New England states, though it has water power enough to supply the whole country. The most numerous and important of the industrial establishments are woollen and cotton factories, marble works, tanneries, iron-foundries, and factories for the production of steam engines and other machinery, carriages, &c.

All the commerce, connected with navigation is carried on by way of Lake Champlain, and the foreign trade is mostly through New York and Massachusetts. The state is crossed and intersected by numerous railways, including two over the mountains, which afford the means of communication with all the principal towns in America; and the Grand Trunk line, extending from Portland to Montreal, runs along the north-east for 35 miles. Two fine railway bridges cross the two arms at the head of Lake Champlain.

**Constitution, Education, &c.**—The internal affairs of the state are under the direction of a governor, lieutenant

governor, Senate, and House of Representatives, who are each elected annually by the popular vote.

**History and Constitution.**—The tract of country between Lake Champlain and Montpelier, called Vermont by the French settlers from its green mountains, was ceded by them to the British in 1763. The French had commenced their settlement as early as 1731, and the provincial government of Massachusetts had built a fort on the west bank of the Connecticut in 1724; but as the natives were numerous and hostile, little progress was made in colonizing Vermont till the British had conquered Canada in 1760, after which time it began to be settled rapidly. Vermont was at first claimed by Massachusetts, and afterwards by New Hampshire and New York. The rival claims were decided by the King of England in council in 1764, in favour of New York. A serious quarrel was the result of this decision, which was interrupted by the war of the Revolution, in which "the Green-mountain Boys," as they were called, distinguished themselves by their hardness and bravery. In January, 1777, they declared the state independent, but New York still claimed jurisdiction, which the inhabitants stoutly resisted. The differences, however, were finally adjusted in 1790 by Vermont paying to New York 33,000 dollars in full of all demands. In 1791 Vermont was constituted a state, and was the first new member of the American Confederacy added to the original thirteen. In Vermont was fought the battle of Bennington, 16th August, 1777, when the British were defeated in two engagements by a superior force.

**VERNAL GRASS, SWEET.** See *ANTHOXANTHUM*. **VERNA'TION**, in botany, is a term for the manner in which the young leaves are arranged within the leaf-bud. It corresponds to the term aestivation, which indicates in what manner the parts of the flower are arranged in the flower-bud.

**VERNET**, the name of three distinguished French painters.

**CLAUDE JOSEPH VERNET**, the eldest, was born at Avignon in 1714. He was instructed by his father, Antoine, and going to Italy in 1732, devoted himself to landscape and marine painting; and after twenty years of labour and poverty, eventually succeeded in establishing a reputation, and in attracting the notice of his own countrymen. Louis XV. invited him to France in 1752, and he was elected a member of the French Academy in the following year; he was in the same year commissioned by the government to paint views of the seaports of France—fifteen of which views are now in the Louvre. He died at Paris, in his apartments in the Louvre, in 1798. The Louvre possesses a large collection of his works.

**ANTOINE CHARLES HORACE VERNET**, commonly called *Carle Vernet*, the son of Claude Joseph, was born at Bordeaux in 1758, and having gained the travelling pension, he also studied in Italy. He painted battles and small pictures in various styles; but was chiefly distinguished for his horses, and for paintings of two of Napoleon's great victories—the "Battle of Marengo," 1804; and the "Morning of the Battle of Austerlitz," exhibited in 1808, for which the emperor decorated him with the cross of the Legion of Honour. Carle Vernet was also a member of the Institute, and a chevalier of the order of St. Michel. He died in Paris, 17th November, 1835. Not the least of his distinctions is that of having been the father and the teacher of the greatest of battle-painters.

**EMILE JEAN HORACE VERNET** (always called *Horrace Vernet* for shortness) was born in Paris, 30th June, 1789. Such was his ability that he maintained himself by his drawings, when still a boy, from fifteen years of age; yet he failed to gain the travelling pension of the French Academy. Brought up by his father, he studied also in the school of Vincent; and before he became of age, he was married, was an exhibitor at the Louvre, and had served



also for a short time as a soldier, which experience proved a valuable initiation for him into the specialties of that service to which he afterwards chiefly devoted his pencil. His facilities of execution and general powers of observation may be termed prodigious. He is said to have possessed the rare faculty of being able to paint objects correctly from memory. He commonly painted *alla prima*, or without retouching, and often without any previous preparation on the canvas or otherwise. With such great powers, Horace Vernet could not fail to have a great career, and he rose rapidly to distinction and honour during the First Empire. Political changes sometimes interfered with his position and influence, but on the whole his career was one of unbroken progress, and of unrivalled celebrity in his own department of painting. He obtained a medal of the first class for historical painting in 1812, and in 1814 Napoleon decorated him with the cross of the Legion of Honour; he became an officer in 1825, and a commander in 1842. In 1826 he was elected a member of the Institute; and in 1828 he was made director of the French Academy at Rome, where he remained about nine years, and where he painted some of his most popular works—among which is conspicuous the large picture in the Palace of the Luxembourg, of “Raffaello encountering Michelangelo on the Steps of the Vatican.” The Luxembourg contains also the following of Horace Vernet’s greatest works—the “Battle of Tolosa,” exhibited in 1817; the “Massacre of the Memlucs” (1819); the “Barrière de Clichy,” or defence of Paris in 1814, painted in 1820; and “Judith and Holophernes,” exhibited in 1831. A vast display of the powers of this painter was shown at the Paris Universal Exhibition in 1855, when he was awarded a grand medal of honour. He exhibited altogether on that occasion twenty-two pictures, including two of those described above and several others of his most celebrated battles.

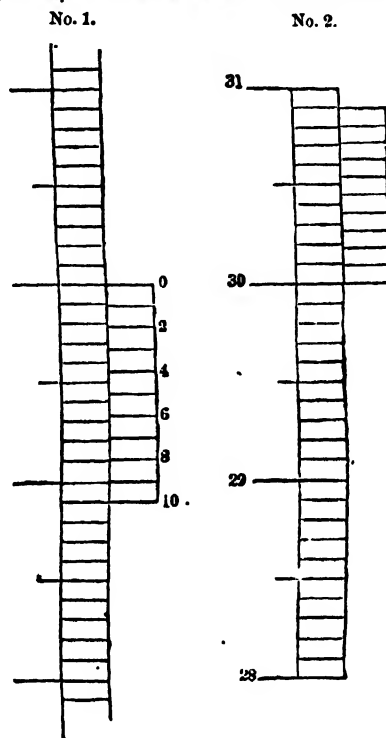
His canvases are the largest of modern times; and of the old masters, Tintoretto is the only man who went beyond him in this respect. He died full of years and honours on the 17th of January, 1863.

Horace Vernet lived in many countries. His residence in Italy has been noticed; he lived also for some time in Algeria, making his studies for his great monumental pictures at Versailles; and he lived also in Russia and in England. There were few of the great European monarchs of his day who did not take a pride in honouring him, and themselves at the same time. He was loaded with decorations. He resided chiefly at Versailles, but he had apartments also at the Institute in Paris.

**VERNIER**, a scale by which linear or angular magnitude can be read off much more accurately than is possible by ordinary mechanical division and subdivision. It is so called from its inventor, Pierre Vernier, who first introduced it in 1631. We shall briefly explain the principle of its action in its simplest form.

Number 1 is the figure of a vernier for measuring hundredths of an inch, such as is usually applied to common barometers. The scale is on the left hand, on which the inches and tenths are marked. The portion on the right hand, which can be slipped up or down, remaining always in contact with the scale, is the vernier. It is merely a length of eleven parts of the principal scale divided into ten equal parts. Each of these parts therefore equals  $\frac{1}{10}$  of an inch, or  $\cdot 1$ , and the difference between a part of the scale and a part of the vernier is  $\cdot 01$  inch. In the figure the zero of the vernier is made to coincide, i.e., to form one continued line with the division 80 on the scale, and consequently 10 on the vernier also coincides with 29·9 on the scale. Division 1 on the vernier is, from what we have said,  $\cdot 11$  inch below zero of the vernier, while the next lower division on the scale is only  $\cdot 10$  below it: hence the vernier division 1 is  $\cdot 01$  inch below the division 29·9 on the scale. For the same reason, division

2 on the scale is twice as much, or  $\cdot 02$  below 29·8, and so on, the divisions on the vernier overlapping those on the scale until 10 on the vernier stretches over to exact coincidence with 28·9 on the scale. Now suppose the vernier to be raised  $\cdot 01$  inch, it is evident that division 1 of vernier will coincide with 29·9. If the vernier were raised  $\cdot 02$  inch, the vernier division 2 would coincide with 29·8, and so on; so that in order to read off the hundredths of an



inch which the vernier zero advances beyond any tenth in the scale, we have merely to see what vernier division comes nearest to a division of the scale, and set that down for the hundredth required.

This is the form which was given to the vernier by its inventor, in which the parts of the vernier are larger than those of the scale, and in which the numbering of the parts of the vernier runs contrary to the numbering of the scale. But if, as in No. 2, the vernier has the length of nine divisions of the scale, and this is divided into ten equal parts, each part will be equal to  $\cdot 09$  inch, while the divisions of the scale are equal to 1 inch. The vernier in this form is to be numbered forwards, as well as the scale. It is clear that raising the vernier  $\cdot 01$  will bring the division 1 of the vernier into coincidence, and so on, exactly as before; and therefore that the inches and tenths being read from the scale, the hundredths are to be taken from the vernier. The reading both scales forward is some advantage in favour of the latter mode, while the size of the vernier divisions is larger, and consequently clearer, in the first.

**VERNON GALLERY**, which may be regarded as the nucleus of the National Gallery so far as British art is concerned, was presented to the nation by the munificence of Robert Vernon, of Ardington House, Berkshire. Robert Vernon was born in 1775. There is little in his private life to interest the biographer; but in the collection of paintings which he presented to the British nation he has left an enduring name. It is sufficient to say, that by a

long course of activity and industry in the business to which he applied himself—the breeding of horses—he succeeded in realizing a sufficient fortune to enable him to expend in works of art above £150,000; and this was not for the mere vanity of buying, but for the encouragement of art; for he always made it a rule to purchase, not from the dealer, but from the artist himself. The National Gallery, with which his name is historically associated, was first established in 1821 by government purchasing Mr. Angerstein's collection of paintings. But the gallery received very few additions, and not a single British one was purchased. At length Mr. Vernon came forward as the generous patron of art, and conceived the idea of presenting his rich collection of pictures to the nation, with the view of forming the nucleus of a gallery of British painters. The offer was accepted by the government, and the Vernon Collection, consisting of 157 valuable pictures, was made over by a deed of gift, in 1847, to the trustees of the National Gallery. He died in 1849.

**VERONA**, a strongly fortified city of Northern Italy, and the chief town of a delegation in the province of Venetia, is situated 72 miles west of Venice, on the Adige, which divides it into two parts. Its situation is pleasant and salubrious, but from its vicinity to the Alps the climate is somewhat cold—the breeze from the mountains being always fresh, and sometimes biting. The Adige, which is a very rapid river, occasionally overflows its banks, and these inundations are usually very destructive. Verona is noted for the beauty of its environs, which are dotted with cypresses, villas, and old feudal castles, while the blue hills and mountains of the Alps form the northern background. From its situation near the gorges of the Tyrol, it has always been considered an important position for the defence of Upper Italy. The city, which is substantially built, with long and tolerably wide streets—especially the Corso—is surrounded by old walls flanked with towers, and retains much of the appearance of a town of the middle ages. The ramparts and bastions constructed by the architect and engineer, San Micheli, in the early part of the sixteenth century, were destroyed, according to one of the conditions of the peace of Luneville, in 1801; but on the city passing into the hands of the Austrians in 1815, the defences were partly restored; and after the war with Sardinia in 1849 every nerve was strained to make it as strong as possible. Indeed, the modern fortifications are among the most remarkable works of military engineering in Europe; and include many bastions, detached forts, an entrenched camp, and a garrison capable of accommodating 20,000 men. The city is a member of the celebrated "Quadrilateral"—composed of Mantua at the south-west angle, Legnago at the south-east, Peschiera at the north-west, and Verona at the north-east—the strength of which, it is believed, induced Napoleon III. to propose the peace of Villafranca in 1859. The two fortresses of Peschiera and Mantua command the line of the Mincio, and Verona and Legnago that of the Adige.

Among the many remarkable buildings of Verona the most worthy of notice are—the splendid Palace Canossa, a modern palace called Della Gran Guardia, in the Piazza di Bra, the Palace Giusta Verza, and the Palace Bevilacqua, whose once rich museum has been dispersed; the finest of its ancient sculptures are now at Munich. The Palace Riolli has a curious representation of the cavalcade of Pope Clement VII. and Charles V. on the occasion of that emperor's coronation at Bologna. Statues in marble or bronze of the celebrated natives of Verona—Paul Veronese, Cataneo, the younger Pliny, Maffei the historian, Vitruvius, Cornelius Nepos, &c.—adorn the façade of the Palace del Consiglio. In the Minciole Palace are valuable collections of armour and of Oriental MSS. The Palaces of the Scaligeri, lords of Verona, are now converted into municipi-

pal buildings. The exchange, the bishop's palace, theatres, some hospitals, and several magnificent fountains, deserve mention among the public buildings of the city, which also contains a fine market-place and some handsome squares. The ecclesiastical edifices of Verona are numerous, and many of them interesting for their monuments and paintings. The Church of SS. Nazario e Celso is said to be of the seventh century. The subterranean galleries in its neighbourhood were once used as catacombs. The Church of San Zenone dates from the ninth century. It possesses a beautiful *campanile* or bell-tower; and is altogether the most interesting example in the city of the ecclesiastical architecture and decorations of the middle ages. The cathedral, a Gothic building, is said to be of the age of Charlemagne. The total number of churches is about forty. The picture gallery of Verona contains about 400 specimens, including a "Transfiguration" of Titian, and a full length portrait and a "Deposition" by Paul Veronese. The library of the Cathedral Chapter is very ancient; it contains 12,000 volumes and about 540 MSS., among which is a palimpsest of the "Institutes" of Gaius. It was in this library that Petrarch discovered Cicero's Epistles "ad familiares." The Teatro Filarmonico is a handsome structure. The sepulchral monuments of the Della Scala family, in the shape of Gothic pyramids, surmounted by the equestrian statues of the various members of that family who were lords of Verona, are remarkable objects. They are situated in a small churchyard, and are inclosed by a beautiful iron trellis-work. The pretended tomb of Juliet is still visited. The amphitheatre of Verona, one of the best preserved monuments of its kind, is noticed under AMPHITHEATRE. Another classical monument, the Arco de' Gavii, the sepulchre of an ancient family, was pulled down in 1805. The Porta de' Borsari, said to have been built by the Emperor Gallienus; and the Arco de' Leoni, also of the imperial age, are fine Roman gateways. The handsome modern gate called Porta del Palio, is the work of San Micheli. \*Remains of an ancient theatre have been discovered. Several fine bridges cross the Adige at Verona; that called Di Castelvecchio is remarkable for the width of the central arch. Among the educational establishments of the city are a lyceum, with fine scientific collections, a royal college for ladies, a school of drawing and painting, an academy of agriculture and commerce, an episcopal seminary, several gymnasia, a botanic garden, a philharmonic academy, two valuable public libraries, and the museum of the Lapidario, with remarkable Etruscan inscriptions and ancient marbles. The amphitheatre, and several of the other public structures of Verona, are built of marble, and consequently present a very fine appearance. The population in 1882 was 68,711. Verona is a principal station on the railway from Milan to Venice. Raw silk, rice, garlic sausages, wool, timber, and leather are the chief articles of commerce; woollen, silken, and linen stuffs are manufactured, and also hats, hosiery, paper, soap, jewelry, &c. The city is celebrated for its dye-works. Excellent cattle are reared on the rich pasturage in the neighbourhood; and wines and fruit are good and abundant.

From its fine situation, military importance, rich historical remains, and literary institutions, Verona has always been considered one of the most interesting towns in Italy. This interest is increased to all lovers of the English drama, by the fact that it is the scene of Shakespeare's tragedy of "Romeo and Juliet." Its early history is not positively known, but it is supposed to have been founded in the fourth, and to have been subjected to the Romans in the second century before the Christian era. It afterwards rose to great importance, and was adorned with numerous magnificent structures. It was captured by Constantine in 312; and on the decline of the Roman Empire it was taken by the Goths, and made by Theodoric the capital of

his empire. The Goths were defeated by Stilicho in 402; and in 774 Verona was taken by Charlemagne, whose son, King Pepin, resided here; and so long as the power of the emperors in Italy lasted, it took a lead among the Italian cities. It afterwards (in 1405) became an independent republic, lost its liberty under lords of its name who ruled it with despotic sway, passed through the hands of various masters, and at length, weary of the vicissitudes to which it had been subjected, voluntarily ceded itself to Venice, under which it remained till 1797, when it became part of the kingdom of Italy under French domination. In 1814 it was transferred to Austria, to which empire it belonged till 1866, when, with the rest of Venetia, it was added to the kingdom of Italy. Since that time many improvements have been carried out in the city, its principal churches and historical monuments have been carefully restored, and a lively impetus has been given to the moral and material progress of the province.

**VERONESE, PAOLO** (PAUL), the name by which the magnificent painter Paolo Cigliari is commonly known. See PAOLO VERONESE.

**VERONICA.** See SPEEDWELL.

**VERONICA, ST.** (*Gr. Beroniké*), according to the later form of the legend, was a maiden who saw the agony of Jesus bearing his cross on the way to Calvary, and handed him her handkerchief with which to wipe his brow. He handed it back to her, and passed on, when the girl found a complete image of the face indelibly imprinted on the cloth, a *vera iconica* or true image. The girl bore this name afterwards from the circumstance which made her famous, and was canonized by the church. Several handkerchiefs of St. Veronica, each of course claiming to be the only true one, exist and are held in great reverence. One of those with the firmest pedigree is at St. Peter's at Rome, and is publicly worshipped on Easter Day; another is at Milan. Some one cruelly added up all the known relics, and found them to cover much more than an acre. The legend is so touching and so widely known that it is little wonder that our forefathers were willing to be deceived by a pious fraud of the kind.

It is not, however, the earliest form of the tradition, which was a much simpler tale. The portrait handkerchief is first mentioned by our own Bede, but is not connected with Veronica. Veronica herself first appears in a MS. of the eighth century, as a follower of Christ—the woman, in fact, who was healed by him (*Matt. ix. 20*), and she had painted, or caused to be painted, upon a cloth the features of her benefactor. This cloth had great virtues, and by means of it Veronica cured the Emperor Tiberius of an illness. A MS. of the eleventh century, now in the university library, Cambridge, makes the cloth part of Jesus' garment, which miraculously impressed itself with the likeness of Jesus when being used upon the emperor. The usual form of the legend in the twelfth century was that Veronica was so hurt at St. Luke's declining to paint her a portrait of the Master that Jesus took pity on her, and once when she gave him water to wash, allowed the cloth with which he dried his face to retain his likeness. Finally, early in the fifteenth century the legend of Calvary as we know it is found. A most exhaustive account of the legend, containing a description of the venerated picture at Rome by one of those rarely favoured persons who have seen it otherwise than at a vast distance (as the public see it on festivals in St. Peter's), was published at Strasburg in German by Professor Karl Pearson (*"Die Fronica"*) in 1887. It is a pity Professor Pearson did not write it in English.

**VERRES, C. CORNELIUS**, one of the most rapacious and tyrannical of the Roman provincial governors, was born about the year 112 B.C. He was quaestor to Cneius Papirius Carbo during his third consulship (82 B.C.), then (having betrayed Carbo) an adherent of the faction

headed by Sulla, and next proquaestor to the rapacious Cneius Cornelius Dolabella, praetor of Cilicia (80 B.C.) The wealth which Dolabella, in return for his unscrupulous services, allowed him to acquire by plunder and extortion he now employed in securing a praetorship. He soon became notorious for those monstrous villainies which ultimately brought him to trial. On the expiration of his praetorship he succeeded Sacerdos in the government of Sicily, the wealthiest and most important province of the empire (73–71 B.C.) He was accompanied thither by a crowd of rapacious followers, and commenced his extortions even before he landed on the island. The Sicilians immediately began to groan under his intolerable yoke. No class was exempted from his cruelty, avarice, and insolent brutality. It seemed to be his set purpose to reduce the island to utter beggary and wretchedness. The people were taxed, the temples robbed of their gold and their statues. An accusation, however, was at length brought against him before the Roman senate. Cicero, who had been Lilybaean quaestor in Sicily in 75 B.C., undertook the cause of the Sicilians, while Verres was defended by Hortensius. But the guilty praetor did not wait the conclusion of the trial—one of the most celebrated that ever occurred. Despairing of a successful issue, he withdrew from the capital before his condemnation was pronounced. He retired to Marseilles, where he lived in affluence and splendour till his proscription by Mark Antony in 43 B.C. His infamous memory has been preserved for the execration of all succeeding ages in the celebrated Verrine Orations of the great Roman orator. Only two of these were actually spoken. The rest are productions of the desk.

**VERRIER, URBAN JEAN JOSEPH LE**, an illustrious French astronomer, was born at St. Lô, in the department of Manche, 11th Mar'ch, 1811. He entered the Polytechnic in 1831, and was admitted to the Academy in 1846. The great undertaking of his life was the recomputation of the tabular places of the planets on the basis of the analysis of Laplace, and the comparison of these theoretical places with actual observation. This undertaking he brought to a successful conclusion, the last sheet of his great work being submitted to him a few weeks before his death. Perhaps, however, his highest claim to remembrance is based upon his remarkable discovery of the planet Neptune, an account of which is given under **ASTRONOMY**. On the death of Arago, in 1853, Le Verrier was appointed to the direction of the Observatory at Paris. He died in September, 1877.

**VERRIO, ANTONIO** (1639–1707), a Neapolitan painter, was recommended to Charles II., and was employed in painting the walls and ceilings of Windsor Castle from 1668 onwards. After the Revolution of 1688, Verrio refused to employ his pencil in the service of William III. Eventually he relented so far in his hostility to William as to consent to paint the king's staircase and several ceilings at Hampton Court. The grotesque allegories and absurd mythological conceits with which he defaced so many of our palaces, are as contemptible as works of art as they are ridiculous in invention and offensive in taste. His slight failing, penury was his portion had not Queen Anne bestowed on him a pension of £200 a year.

**VERROCCHIO, ANDREA DEL**, a distinguished Florentine painter, born in 1432. He was the scholar of Donatello, and the master of Leonardo da Vinci; but he is said to have given up painting on seeing himself surpassed by his pupil. Verrocchio was a good anatomist, and was the first, or one of the first, among the moderns to take plaster casts from the human limbs for art purposes. He attained a great reputation as a sculptor in bronze, and was in 1479 invited to Venice to make the colossal equestrian statue of Bartolomeo Colleoni; but he caught cold, and died in 1488 before the work was actually cast, though the

model was quite complete from his hand, and a very noble work it is. Leonardi completed it, and placed it in its present position in 1495. Verrocchio's other principal work is the bronze group of the "Incredulity of St. Thomas," in the church of Or San Michele at Florence; it was made in 1483, and weighs nearly 4000 lbs.

**VERSAILLES**, capital of the department of Seine-et-Oise, in France, 11 miles by railway south-west from Paris; it had 49,852 inhabitants in 1886. It was a village in the time of Louis XIII., who built a hunting-seat here on the site of an ancient priory; Louis XIV., by devoting enormous sums to its embellishment, converted it into the most magnificent palace in Europe. Under this prince (from 1672) and Louis XV. and XVI. it was the ordinary residence of the court; and the village of Versailles grew into a handsome city. It is now divided into two nearly equal parts by a noble avenue, nearly half a mile long, running east and west, planted with four rows of elms, forming three alleys, with a total breadth of at least 288 feet. The centre alley, which is paved, forms part of the highroad to Paris, and enters the town on the east, affording the traveller a view of the palace, which faces the avenue at its western extremity. Versailles itself is thus divided into Old Versailles, on the south side, and the Quarter of Notre Dame on the north; the two parts, however, are equally modern, and consist of straight, broad streets crossing each other at right angles. The mansions, &c., occupy a great extent of space as compared with the population. There are two market-places, one in Old and one in New Versailles; and the city is adorned with several handsome fountains and palatial residences. It was formerly considered one of the handsomest towns in Europe, the houses being almost all elegant and of a uniform height.

The middle of the town front of the palace is formed by the building of Louis XIII. It has a centre and two wings advancing at right angles so as to inclose three sides of a court, which is open on its fourth or east side towards the Place d'Armes. The central and principal part of the Palace of Louis XIV. forms three sides of a quadrangle, sufficiently large to envelop in its inclosure the older Palace of Louis XIII., so that the two buildings stand back to back, that of Louis XIII. fronting the town, and that of Louis XIV. the garden. The latter is adorned with Ionic columns, eighty-six in number, arranged in fifteen colonnades, of four, six, or eight, each colonnade supporting a cornice crowned with as many statues as there are pillars. The galleries and saloons are of great size and splendour, and all that money, labour, skill, and the highest art could accomplish, have been employed in their ornamentation. The palace was built from the designs of J. H. Mansard and Le Brun. The frontage to the garden, which it faces on three sides, is 1900 feet. The garden or little park, immediately before the west side of the edifice, is an irregular polygon about 3 miles long from the palace to its western extremity, and about 2 miles broad. It is included in the limits of the great park, which is estimated to be from 20 to 25 miles in circuit. The garden was laid out by Le Notre, in terraces, parterres, and alleys, adorned with a profusion of statues, vases, and other sculptures; with a canal in the shape of a cross, and other pieces of water of the same formal character, and a number of magnificent fountains, which are supplied with water from the Seine. The orangery is remarkable for the number and beauty of the trees.

The interior of the palace was magnificently fitted up and decorated by Louis XIV. After the first Revolution the building was almost totally neglected; but by Louis Philippe, who spent altogether £900,000 on the building and decorations, it was thoroughly repaired, and converted into a national historical museum of sculpture and painting, which was opened to the public on the occasion of the

marriage of the Duke of Orleans, 10th June, 1837. This museum consists of a series of paintings and statues arranged in chronological order, in immense galleries, and it includes trophies of all the most important French victories, from Clovis downwards. The pictures illustrate the history of the country from the Crusades to the Italian War of 1859, and comprise many fine portraits of French heroes, &c. Adjacent to the north wing of the building on the town side, are the chapel and the opera-house.

The Cour d'Honneur, one of the principal approaches to the palace, contains a large equestrian figure of Louis XIV., and statues of Richelieu, Condé, Turenne, Bayard, and other celebrated Frenchmen. In the park of Versailles are the two royal country houses of the Grand Trianon and the Petit Trianon, with their respective gardens. The Grand Trianon was built by Louis XIV.; the Petit Trianon by Louis XV. The English Garden, which is the great attraction of the Petit Trianon, was formed by the orders of Marie Antoinette. In the Place d'Armes, opposite to the town front of the palace, are two ranges of stables of great extent; and close by is the Grand Commun, a heavy building, which had a thousand sleeping-rooms, and is now a military hospital. To the south-east and south are the kitchen garden and a very large piece of water called La Pièce des Suisses. The former mansion of the grand-master of the king's household, and of the chief huntsman, are now converted respectively into the town-hall and the court-house: the former Garde-Meuble is the prefect's office. The Tennis Court, termed the *Jeu de Paume*, famous for the oath taken in it by the National Assembly, 20th June, 1789, was for many years the studio of Horace Vernet, who executed here all those of his paintings that adorn the palace collection. The general hospital is one of the finest in France. The city has also a national college, normal, ecclesiastical, and other schools, a public library of 60,000 volumes, many scientific and literary societies, civil and commercial tribunals, chambers of agriculture and of commerce, a horticultural society, mineralogical and geological collection, theatre, several barracks, prison, &c.

Versailles is more a city of pleasure than of industry, with few manufactures and a little trade. The town has a good corn market, some breweries and tanyards, and a number of nursery grounds. Two lines of railway afford easy communication with Paris.

Versailles gave title to a bishop, whose diocese is the department of Seine-et-Oise. The city was the birthplace of Philip V. of Spain; Louis XV., XVI., and XVIII., and Charles X. of France; General Hoche, the Abbé de l'Épée, and Ducis. The first superior of the priory was Hugo de Versallus, in the eleventh century.

Many important treaties have been signed in the Palace of Versailles—one of them being that by which England recognized the independence of the United States of America in 1783. During the siege of Paris by the Germans, in 1870-71, Versailles was occupied by the King of Prussia, who was here proclaimed Emperor of Germany on 18th January, 1871. Preliminaries for peace between France and Prussia were signed here on the 26th February of the same year. The sittings of the Chamber of Deputies were held at Versailles from the close of the war to 1880, when the Chambers again met in Paris, and the city has since assumed the settled quiet aspect it presented before the war.

**VERSE** (Lat. *verso*, I turn, because of the turning back of the eye from the end of one line to the beginning of the next) is a variety, or group, or portion of metres, written in one line, and as being rhythmically accented or measured, opposed to *prose*. A group of lines, though frequently styled a verse, is really a stanza. The term is sometimes used generally to signify metrical composition. Thus we speak of Pope or Tennyson as a master of verse.

The division of the books of the Bible into verses was applied in the earliest MSS. to those parts of the text, as the Psalms and Solomon's Song, which were written in poetical language; but was carried through the other Biblical books by Henry Stephens, the great French printer. It was adopted into the English Bible printed at Geneva in 1562, and into the Authorized Version in 1611. Various odd researches have been made with regard to the verses of the Bible; as, for instance, the shortest verse, John xi. 35; the verse which contains every letter of the English alphabet, Ezra viii. 21; and that which contains every Hebrew letter, Zephaniah iii. 8, &c.

**VERSE**, in cathedral music, means a solo part or a portion for solo voices (duet, trio, &c.), as distinguished from a full portion for the whole choir. Hence a "Verse Anthem" means an anthem with solo parts.

**VERSE, NECK** (Psalm li. 1). See **NECK VERSE**.

**VERSES, FESCENNINE**. See **FESCENNINE VERSES**.

**VER'SION** (Lat. *versio*, a turning, from *verto*), a term now confined to the various translations of the Scriptures into modern languages. The ancient versions were the Æthiopic, Arabic, Armenian, Chaldee (or Targum), Egyptian, Greek (or Septuagint), Latin (or Vulgate), Samaritan (or Pentateuch), and Syriac. The first English translation was made by Wyclif, "the morning-star of the Reformation," in 1380; another was effected by Tyndale and Miles Coverdale, in 1525-35. The Bishops' Bible appeared in 1568; the Authorized Version was commenced in 1601, by direction of James I., who chose fifty-four prelates, clergymen, and scholars for the purpose. It was first published in 1611, and its language has been deservedly praised as "a well of English undefiled." In 1872, however, a careful revision was commenced by a committee of learned churchmen and non-conformists, the final result of their labours being presented to the world in 1885.

**VERST** or **WERST**, a Russian measure of length containing 3500 feet, about two-thirds of an English mile.

**VERTEBRA**. See **BACKBONE**.

**VERTEBRATA** is the highest subkingdom or phylum of the animal kingdom. The term was first applied by Lamarck to that group broadly marked off from all other animals (Invertebrata) by the possession of a bony or cartilaginous axial skeleton. This distinction, however, was first pointed out by Aristotle, though the name he gave to the group, "Animals with blood" (Gr. *Enaimia*), was based upon imperfect knowledge. In its strict interpretation the term employed by Lamarck is also faulty as a definition, for some vertebrates never possess a true vertebral column. It is upon a combination of characters that the distinctness of the Vertebrata as a natural group is founded. The chief of these is the possession of an axial skeleton, which, however, primitively is neither bony nor cartilaginous, but consists of an axial skeletal rod (*notochord*) of soft gelatinous tissue, dorsal in position and serving for the support of the muscles. This is the primitive condition of the vertebral column in all vertebrates, and the permanent condition in the lowest forms. Subsequently, both in the development of the race and of the individual, the notochord is more or less replaced, first by cartilaginous then by bony elements, until we reach the condition of the typical vertebral column, composed of a series of bony pieces or vertebrae and ending anteriorly in the bony skull. The next important character of the Vertebrata is the tubular nervous system, consisting of a hollow nerve-cord, more or less enlarged at the anterior extremity to form the brain. This lies immediately above the axial skeleton, which in all but the lowest vertebrates forms a protection to it. On the ventral side of the axial skeleton are placed the alimentary canal with the rest of

the viscera and the heart. In this way a transverse section through the body of a vertebrate cuts through two tubes, the nerve-cord and the general body cavity, separated by the axial skeleton. The eye of vertebrates is more closely related to the nervous system than in other animals, its essential part, the retina, being formed by lobes of the nerve-cord itself. In all vertebrates the most anterior part of the alimentary canal, the pharynx, is pierced by a greater or less number of slits or clefts which primarily subserve respiration. Similar gill-slits are, however, possessed by a remarkable worm-like animal, *Balanoglossus* (forming an isolated group, *Etebopneusta*).

The Vertebrata, then, may be defined as laterally symmetrical animals, with an axial skeleton separating the general body-cavity from a tubular nerve-cord, out of which the main portion of the eye is formed, with the anterior portion of the alimentary canal pierced by gill-slits, and with segmentation exhibited more or less completely in the axial skeleton and the associated muscles.

**Skeleton**.—The skeleton of the Vertebrata consists of two parts, the dermal external skeleton or *exoskeleton*, and the internal skeleton or *endoskeleton*.

The external skeleton arises entirely in the SKIN, and is composed of the epidermis, alone or in conjunction with the dermis or cutis. Of this nature are scales, hairs, feathers, claws, nails, horns, scutes, and teeth. True scales are modifications of the epidermis, and form the covering of snakes and lizards, and are also found on the legs of birds. In the formation of the scales or scutes of fishes the cutis also takes part. Some fishes (sharks, sturgeon) have bony denticles on the skin, formed chiefly from the cutis, and very similar to true teeth, which latter are generally present in the month throughout the Vertebrata. Hairs, the covering of mammals, and feathers, the covering of birds, are formed chiefly by the epidermis, as are claws or nails, protecting the tips of the limbs in most vertebrates above fishes. Horns are peculiar to mammals. A solid exoskeleton, formed by the interlocking of dermal plates, is sometimes found, as in some fishes, the tortoises and turtles among reptiles, and the armadillos among mammals.

The internal skeleton of vertebrates is usually divisible into two parts, the *axial*, or that of the axis, including the cranium or skull, and the *appendicular*, or that of the limbs.

**Axial Skeleton**.—The axial skeleton consists, as has been said, essentially of the notochord, which is formed by a thickening of the cells of the hypoblast, and becomes surrounded by a fibrous sheath. With this exception, the whole of the internal skeleton of the Vertebrata is formed from the third germ-layer, the mesoblast. An organ similar in origin and structure to the notochord is found in the Tunicata, but in these animals it is confined to the tail-region, and disappears in most cases before maturity, whereas in the Vertebrata it runs right through the body, and persists till it is gradually replaced by the vertebral column. The possession of such an organ, however, together with certain points in their development, have induced some zoologists to place the Tunicata, formerly classed with the Mollusca, in the vertebrate subkingdom. [See **TUSICATA**.] In another form, the lancelet (*Amphioxus*), the notochord extends to the extreme anterior end of the body, and persists throughout life in its simple condition. In all other vertebrates the notochord stops short of the extreme anterior end of the body, and is there continued by the *cranium* or skull. In the lamprey and its allies (*Cyclostomata*) the notochord persists, invested by its fibrous sheath, but a series of cartilaginous arches arise from it, protecting the spinal portion of the nerve-cord. In the ascending scale we find in the lowest fishes, in addition to these neural arches, inferior cartilaginous arches protecting blood-vessels, while the notochord itself becomes surrounded

by a cartilaginous sheath. This cartilaginous sheath further encroaches upon the notochord and breaks it up into a series of segments, the tissue of the notochord remaining only at each end of such segments, and becoming wholly replaced by cartilage in the middle. The next stage is that of the replacement of the cartilage by bony tissue, resulting in the condition which obtains in the bony fishes and all higher vertebrates, that of a bony vertebral column or backbone formed of a series of bony segments, the vertebrae. Slight traces of the notochord, however, still persist between or within the centra or bodies of the successive vertebrae. See BACKBONE.

Closely connected with the backbone are the ribs and the sternum or breast-bone. The ribs are prolongations of the transverse processes of the vertebrae, with which they generally articulate on becoming separated as distinct pieces. They are found in all but the lowest vertebrates, but in some fishes and amphibians they are very rudimentary. When fully ossified they are long, slender, curved bones, tending to surround the trunk, and the more anterior joining the sternum. The sternum or breast-bone originates through the fusion of cartilaginous segments (copulae), formed by the junction in the middle ventral line of a number of ribs with their fellows of the opposite side. It is absent in the whole class of fishes, and in the serpents, tortoises, and turtles, and some lizards, among reptiles. In the higher vertebrates a number of ribs, called "true ribs," are attached to the sternum by means of the costal cartilages; behind these are a greater or less number of "false ribs" which do meet the sternum. In birds and some mammals (bats, mole), a median keel is developed on the sternum.

*Skull.*—The skull or cranium is the most anterior part of the axial skeleton. It consists essentially of a cartilaginous investment for the swollen anterior part of the nerve-cord or brain, and is supported by the extremity of the notochord. To this *primordial cranium* are added the sense-capsules and some of the visceral arches. [See SKULL.] In Amphioxus there is no skull. In the Lampreys (Cyclostomata) there is a small cartilaginous cranium, to which are attached the sense-capsules, but the visceral arches are not developed. In the higher vertebrates there are a series of deep-lying cartilaginous arches developed in the sides of the gill-slits; these are the visceral or branchial arches. The first or mandibular arches over the mouth to form the jaws. The second or hyoid arch, in most fishes, forms in its upper part (hyo-mandibular) the attachment of the first arch to the skull. The remaining arches, the true branchial arches, of which there may be as many as seven, form primitively the support for the gill-slits, and are directly connected with respiration. In the sharks and rays the skull, with its connected visceral arches, remains entirely cartilaginous. In other fishes bones are added to it, either as the result of the ossification of the cartilaginous cranium, or as bones formed directly from membrane. Ossification of the cartilaginous cranium begins in the hinder or occipital region, the basi-occipital bone being developed beneath the occipital foramen, the aperture through which the nerve-cord enters the skull. On each side of the foramen ossifications may appear, giving rise to the ex-occipital bones, and above it to an ossification, the supra-occipital bone, forming the roof of the occipital segment. In front of this segment the auditory capsule, which is fused with the cartilaginous cranium, generally ossifies to form three bones, the pro-, opistho-, and epi-otic bones. In front of the basi-occipital bone the base of the cranium ossifies as the basi-sphenoid bone, and its lateral walls in front of the auditory capsule ossify as the alio-sphenoid bones, which generally unite below with the basi-sphenoid. In front of the basi-sphenoid the base of the cranium ossifies as the pre-sphenoid, united with which are the orbito-sphenoids, formed by the ossification

of the lateral walls. The optic capsules form the orbits for the eyes, and never become fused with the skull; in birds they ossify as the sclerotics. The olfactory or ethmoidal region of the skull does not form part of the cranium proper, but may be represented by one or more ethmoid bones. The roof of the skull in front of the occipital segment is formed by membrane bones, the two parietals roofing over the basi-sphenoidal region, the two frontals the pre-sphenoidal region, and the nasals (one or two) the ethmoidal region. Between the parietals and the supra-occipital may arise two other membrane bones, interparietal and squamosal, the latter on the upper surface of the auditory capsule. In the bony fishes, amphibians and some reptiles, the base of the skull exhibits a very large dagger-shaped membrane bone, the para-sphenoid, underlying it from the basi-occipital to the pre-sphenoid; traces of this persist even in mammals. Below the ethmoidal region is a similar membrane bone, the vomer, which is sometimes paired. In the region of the orbit arise the lacrymals, pre-, supra-, and post-orbitals, and post-frontals.

The upper part of the first visceral or mandibular arch forms the primitive upper jaw, and ossifies as the palatine, pterygoids, and quadrate; the lower part forms the lower jaw, and ossifies as the articular, angular, and dentary. The primitive upper jaw is usually pushed to the middle line to form the roof of the mouth, and its place usurped by membrane bones, the premaxilla (single or paired) and maxilla. Behind the maxilla another membrane bone may arise, the jugal or malar, connected with which there is occasionally another, the quadrato-jugal bone. In the bony fishes the whole of this facial apparatus is attached to the skull by means of the upper portion of the second or hyoid arch, the symplectic bone being attached to the hyo-mandibular above and the quadrate bone below. These bones form the "suspensorium" for the lower jaw, the joint of which is between the quadrate and the articular bone. In the higher vertebrates the primitive upper jaw becomes fused with the skull behind and in front of the orbit, and the lower jaw is attached to the skull by means of the quadrate. In the mammals the quadrate and articular are much reduced and sunk within the auditory capsule, protected by the tympanic bone; and the lower jaw, consisting of a single bone, the dentary, is attached to the skull by means of the squamosal. In the bony fishes the lower part of the hyoid arch ossifies as several bones, with which the bones of the operculum become connected; and the remaining branchial arches, five in number, each form several bones. In all higher vertebrates this part of the hyoid arch and all the remaining arches are much reduced, and form the hyoid bone, which supports the base of the tongue; while the upper part of the hyoid arch becomes connected with the auditory capsule.

*Appendicular Skeleton.*—Except in fishes there are never more than two pairs of limbs in the vertebrates. Fishes have in addition to the paired pectoral and ventral fins, which are homologous with the limbs of other vertebrates, unpaired fins, which may either form a continuous vertical fringe round the body, running from the head round the tail to the vent, or be broken up into dorsal, caudal, and anal fins. According to Huxley the paired fins also arose as differentiations of continuous lateral folds of the body, and hence the two kinds of fin have a precisely similar origin. Amphioxus and the Cyclostomata have no lateral fins, and in the higher vertebrates one or both pairs of the lateral fins or limbs may become rudimentary or be altogether lost. In the sharks and rays the lateral fins appear in the form of a basal cartilage (basi-pterygium, sometimes broken up into three pieces), articulated with which are a number of slender radial cartilages, to which latter are attached the horny fin-rays which form the support of the membranous portion of the fin. The dorsal fin of these fishes is very similar.



The paired fins have, however, pushed their way inwards and acquired a connection with the vertebral column by means of the limb-girdles. These in their simplest form consist merely of a cartilaginous arch, formed of two ingrowths from the basal cartilage of the limb. When ossified the pectoral or anterior girdle consists of three portions, an upper portion—the scapula, a posterior lower portion—the coracoid, and an anterior lower portion—the clavicle, the latter being a membrane bone, replacing a primitive cartilaginous segment, the precoracoid. The pectoral girdle generally forms a close connection with the sternum. The pelvic or posterior girdle likewise consists of three pieces, an upper portion—the ilium, an anterior lower portion—the pubis, and a posterior lower portion—the ischium. Except in fishes the ilium is solidly connected with the vertebral column at the sacrum, formed of one or more vertebrae. In the vertebrates above fishes traces of the vertical fins may persist, but as mere tegumentary structures, without fin-rays or other skeletal parts. In these higher vertebrates the limbs are essentially of the same type (cheiro-pterygium), consisting of a main part, arm or leg, and an extremity, hand (manus) or foot (pes), the latter ending in five digits. The arm is divisible into two segments, the brachium, formed by the humerus, and the ante brachium, consisting of two bones, the radius and ulna, which are sometimes united. The hand consists of three portions: the carpus, composed of a varying number of bones; the metacarpus, composed normally of five bones; and the digits, five in number, composed normally of three bones, the phalanges. [See ARM; HAND.] The leg in like manner is divided into two segments, the femur or thigh, and the crus, consisting of two bones, the tibia and fibula, sometimes united. The foot consists of the tarsus, metatarsus, and digits, corresponding to the divisions of the hand. [See FOOT.] In both hand and foot the number of the digits and of the corresponding metacarpal and metatarsal bones may be reduced.

The body of vertebrates is generally divisible into three regions, the head, trunk, and tail. The head contains the brain and the special organs of sense. The brain arises as a swelling of the anterior portion of the nerve-cord, forming three vesicles. The first of these subsequently divides into two parts, the prosencephalon, forming the cerebral lobes, and giving rise anteriorly to the olfactory lobes, and the thalamencephalon, from which outgrowths arise to form the retina of the eye. The second vesicle is the mesencephalon, giving rise to the optic lobes, with which the nerves to the eye become subsequently connected. The third vesicle divides to form the mesencephalon or cerebellum and the myelencephalon or medulla oblongata, which is continuous with the myelon or spinal cord. The cerebral lobes or hemispheres are small in fishes, but increase in size in the higher vertebrates until in the mammals they form the mass of the brain. [See BRAIN.] Nerves are given off from the brain, usually twelve in number. Spinal nerves are also given off by the spinal cord in correspondence with the segments of the vertebral column, and their ventral branches bear ganglia, forming the sympathetic nervous system. The usual sense-organs are generally present, but the auditory organ is absent in *Amphioxus*, and of a very simple type in the *Cyclostomata*. In the latter the nasal sac is single, and in the gill-breathing vertebrates it is a paired blind sac; in all higher vertebrates it is paired and communicates with the cavity of the mouth.

Respiration is by means of gills in the lower, and lungs in the higher, vertebrates. The gills arise as pouches connected with the gill-slits, and in the gill-breathing vertebrates above the *Cyclostomata* they are borne on the visceral arches. They generally consist of double rows of lancet-shaped lamellae, richly provided with bloodvessels. Usually they are protected by a fold of the skin, which

may become bony, but sometimes they are external, as in some amphibians. The lungs appear as an outgrowth of the alimentary canal. In most fishes above the sharks this body forms a hollow sac with a hydrostatic function, the air-bladder. In some ganoid fishes, and especially in the Dipnoi, it acquires a cellular structure, and in some cases becomes divided into two sacs and assumes a respiratory function. In all higher vertebrates the lungs are a pair of hollow cellular sacs filled with air and communicating with the pharynx. In the amphibians gills may co-exist with lungs through the entire life, or part of it. In the lung-breathing vertebrates the gill-slits disappear in embryonic life, except the most anterior, which persists in connection with the ear as the Eustachian tube. See RESPIRATION.

The alimentary canal is a tube opening in the head by the mouth, and ending at the extremity of the trunk at the anus or vent. The following regions may generally be recognized:—The pharynx, pierced by the gill-slits; the oesophagus; the stomach, a large dilation in which the chief process of digestion is performed; the small intestine, with the glandular outgrowths, the liver and pancreas; and the large intestine, leading to the vent. The vent is usually situated in a cloacal chamber, into which the ducts of the urinary and generative organs open. There is always a distinct vascular system with red blood, and in all except *Amphioxus* there is a muscular heart, placed on the ventral side of the alimentary canal, and consisting essentially of two chambers, an auricle and a ventricle, which in the highest vertebrates become divided each into two parts. In the simplest type of circulation in the Vertebrata there is an unpaired vein (caudal vein) in the tail connected with a pair of veins (inferior cardinal veins) in the ventral part of the body-cavity; these veins collect the venous blood by lateral branches from the capillary system. The blood is conducted to the auricle through the portal system, passing through the liver. Anteriorly the auricle also receives venous blood from a pair of superior cardinal veins. From the auricle the blood passes into the ventricle, and thence into a great artery, the ascending aorta, which gives off lateral branches to each of the visceral or branchial arches. These branches form a series of vascular arches, which unite beneath the vertebral column to form the dorsal or descending aorta. A special part of the vascular system is that of the lymphatic vessels which convey the lymph to the blood. The renal or urinary system originates in the form of organs resembling the nephridia of the chaetopod worms. In the *Cyclostomata* there is a main duct (archinephalic duct), into which open a series of tubules with funnel-shaped apertures, lying one in each segment of the body and opening into the body-cavity. From this primitive excretory organ are formed in the higher vertebrates, not only the kidneys and their ducts, but in all, except the bony fishes, the ducts of the generative organs also. In the bony fishes the generative products sometimes fall freely into the body-cavity, and sometimes are conveyed to the exterior by special ducts. The sexes are always distinct.

*Development.*—The special points in the development of the Vertebrata have already been touched on in the description of the several organs. See also DEVELOPMENT and EMBRYO.

*Classification.*—The primary classification of the Vertebrata is into *Acraniata* (or *Cephalochorda*) and *Craniata*, the first group containing the *LANCELLATE* (*Amphioxus*) alone, and the second the remainder of the Vertebrata. As has already been said, some zoologists place the *TRICERCATA* upon the vertebrate stem, forming a third primary group, to which the name *Urochorda* (Gr. *oura*, tail, *chorde*, string, chord) has been given. The *Craniata* are then divided into two groups, the *Cyclostomata* (or *MONORHINIA*), containing the lampreys and hag, and the *Gnathostomata* (or

Amphirhina). The Gnathostomata form the mass of the Vertebrata, freed from the lowest forms, the lancelet, lamprey, and hag. This group falls into the familiar division, **FISHES, AMPHIBIA, REPTILES, BIRDS, and MAMMALIA**, which, with one exception, that of the separation of the Amphibia from the reptiles, was established by Linnæus, and practically recognized since the days of Aristotle. These great classes have been brigaded, so to speak, into three groups. The fishes (from which the Dipnoi are sometimes separated as a distinct class) and the amphibians form a group, to which Huxley has given the name **ICHTHYOPSIDA**. The reptiles and birds are combined by the same authority into a group, **SAUROPSIDA**. The mammals, lastly, form the highest group of the vertebrate subkingdom.

**VER'TEX**, a name given to any remarkable or principal point, particularly when that point is considered as the top or summit of a figure. Thus we have the three vertices of a triangle, the vertex of a cone or pyramid, &c.

**VERTICAL**. The zenith being considered as a vertex, which in fact it is, when the word vertex means summit, a vertical plane is one which passes through the line drawn from the spectator to his zenith; a vertical plane therefore merely means one which is perpendicular to the horizon, and a vertical line has the same meaning.

**VER'TICIL or WHORL** is the term applied in botany to a ring of any kind of organs, arranged round an axis upon the same plane. The term *verticillaster* is given to a false whorl formed in the order Labiata by the presence of short-stalked or sessile cymes in the axils of opposite leaves.

**VERTIGO**. See GIDDINESS.

**VERTUM'NUS** (or *Vortumnus*), a god of Roman worship, believed to have been borrowed from the Etruscans, or, as some antiquarians think, the Sabines. He was essentially the god of change (*verto*), and hence was not only the god of seasons, but also the god of business, &c. It was chiefly, however, as the god of fruitage that he was worshipped, his function being to watch over the changes of the fruit from the blossom to the harvest. He wooed the orchard-goddess Pomona (*pomum*, an apple), and gained her by his many delightful transformations. His cult was of great importance, though we know little of him, for the poets rather neglected him. He had a special government priest appointed (*flamen*), and his temple was in the busiest street of Rome, the *Vicus Tuscus*, as befove a god of barter and sale.

**VERUS, LUCIUS** (whose real name was *Lucius Cæionius Commodus*), a Roman emperor, reigned as the colleague of Marcus Aurelius from 161 to 169. The father of Verus had been adopted by Hadrian, and when the father died the son was adopted by M. Antoninus, called afterwards Pius. Verus had been educated by the most distinguished grammarians and philosophers of the time, but had no taste for intellectual occupations. So long as he was under the direct influence of M. Aurelius his vicious character did not fully disclose itself. In 162 he took the field against the Parthians, but instead of conducting the war in person, he left it to his generals, who gained victories, while the emperor revelled in debauchery, with which he became familiar in the towns of Asia, especially at Antioch. In 164 he went to Ephesus, where he celebrated his marriage with Lucilla, the daughter of his adoptive father (Antoninus Pius), or, according to others, of his adoptive brother. After the close of the war he returned to Rome, accompanied by hosts of actors, freedmen, and low persons, who ministered to his vulgar pleasures, and in 166 he and Marcus Aurelius solemnized a triumph over the Parthians. Soon after this Rome was visited by a fatal pestilence, and at the same time the Marcomanni and Quadi invaded the empire from the north. Both the emperors, at the head of their armies,

marched to Aquileia. Verus took scarcely any part in the war, but as usual gave himself up to his pleasures. When hostilities had ceased, the two emperors returned to Rome. On his way thither L. Verus was seized with a fit of apoplexy at Altinum, in the neighbourhood of Venice, where he died (169) in the forty-second year of his age. There is a marble bust of Verus in the British Museum; a heavy, handsome, sensual face, with a profusion of curly hair.

**VER'VAIN**. See *VERBENA*.

**VERVIERS**, a town of Belgium, on the Vesdre, in the province and 14 miles E.S.E. of Liège. It consists mostly of narrow irregular streets, has several fine churches, a town-house, and theatre, and is celebrated for its manufactures of broadcloth, which is largely produced in the town and neighbourhood. Yarn is also largely spun, and the town is rapidly increasing in prosperity. The population in 1880 was 40,944.

**VESA'LIVS, ANDREAS**, the most celebrated anatomist of the sixteenth century, was born at Brussels in 1514. Medical skill appears to have been hereditary in his family. His general education was obtained at Louvain, and his medical knowledge at Cologne, Montpellier, and Paris. While a pupil his zeal in the study of anatomy attracted the notice of Guntherius, who, in 1536, made him his principal assistant. In the same year Vesalius discovered the origin of the spermatic bloodvessels. He was afterwards professor at Louvain, at Bologna (1538), at Padua (1539), again at Bologna (1543), and finally at Pisa, with an annual stipend of 800 crowns. His career as a teacher of anatomy was cut short by a call to attend the Emperor Charles V. as his physician. He quitted Pisa in 1541, and for some years resided at the imperial court, and afterwards at the court of Philip II. of Spain. But writing from Madrid in 1561, he states that he cannot even get a skull to examine; and he added scarcely anything to his anatomical knowledge after leaving Pisa. He obtained, however, a high reputation as a practical physician. It was in 1563 or 1564 that Vesalius undertook the pilgrimage to Jerusalem which led to his death. The reason for the pilgrimage was, that having been summoned to make a post-mortem examination of a Spanish gentleman, he observed on opening the pericardium some movement in the heart; that the fact became known to the relatives of the deceased, who accused Vesalius before the Inquisition; and that to avert a worse punishment Philip II. procured an injunction of a pilgrimage to the Holy Land in expiation. There appears, however, to be no actual proof of this story, unless its currency soon after the anatomist's death be admitted as evidence. While Vesalius was at Jerusalem in 1564, he received from the Venetian Senate an invitation to succeed Fallopius in the chair of anatomy. He accepted the invitation, but in the voyage to Italy he was wrecked on the Isle of Zante. There he died, according to some accounts, of starvation, but probably from hardship and exposure. While at Padua, in 1539, Vesalius published some anatomical plates, and for the four following years his time was chiefly spent in the production of his great work on human anatomy. For this purpose he associated with himself the first artists of the day; among others, Titian is said to have employed his pencil in illustrating the book. In 1542 an abridgment of the work appeared; and, in the following year, the whole work, entitled "*De Corporis Humani Fabrica, libri septem*" (Basel, folio, 1543). Another edition was published by the author in 1555, and after his death it was frequently reproduced. It would not be easy to overrate the importance to anatomical science of Vesalius' work. His power of observation, industry, and acuteness were only equalled by his boldness and freedom from reverence for antiquated error. He attacked the errors of Galen and others of the ancients with vigour, but always adduced anatomical evi-



dence of the truth of his own assertions. The established teaching did not, however, want defenders.

**VESICA PISCIS** (Lat., fish-bladder), a peculiar form of glory much used in the twelfth century to surround the head of Jesus and the saints. Instead of being circular it is made of two arcs of circles, touching top and bottom and forming an ovoidal figure like that which might be made from a Gothic arch and its reflection in a clear stream. The shape was held to refer to the fish (Gr. *ichthus*), which yielded in its Greek name the initials of a sacred formula *I'esus Christos, Theou uios, Sôtêr*—"Jesus Christ, God's Son, Saviour."

**VESICANT.** See BLISTER.

**VESICULAR STRUCTURE**, in geology. Igneous rocks which have cooled near the surface are generally filled with small rounded cavities, produced by imprisoned steam, and are then said to be *vesicular* (i.e. filled with *vesicule*, or little bladders). An extremely vesicular igneous rock is *Pumice* stone, and amygdaloids are old rocks of this character in which the original cavities have been filled up by mineral matter.

**VESOUL**, a town of France, the capital of the department of Haute-Saône, situated at the foot of the vine-clad slope of the conical hill of La Motte, 198 miles E.S.E. of Paris. It is well built, and has a handsome town-house, a communal college, public library of 26,000 volumes, and manufactures of cotton, clocks, refined wax, and leather; and a trade in corn, iron, wine, and cattle. The population in 1886 was 8525.

**VESPA'SIAN** (*Titus Flavius Sabinus Vespasianus*), Emperor of Rome, was a native of the Sabine territory, and was born on 17th November, A.D. 9. In early life he was *tribunus militum* in Thrace, and quaestor in Crete and Cyrene. He also filled the offices of ædile and prætor. He married Flavia Domitilla, who bore him two sons. In the reign of Claudius he served in the army in Germany as *legatus legionis*, and afterwards in Britain. In A.D. 51 he was consul, and also proconsul of Africa under Nero. In A.D. 66 he went into the East with a powerful army against the Jews. While prosecuting the Jewish War he became emperor, A.D. 69. In consequence of his elevation he left the conduct of the war to his son Titus, and ordered Mucianus, governor of Syria, to march against the rival emperor, Vitellius. The latter was defeated and put to death at Cremona. As soon as the news of Vitellius' defeat reached Alexandria, Vespasian sent vessels laden with corn to Rome, and forwarded an edict repealing the laws of Nero and his three successors. Having arrived at Rome he began to restore order in the city, and to pursue such measures as would tend to the good of the people. He introduced a better discipline into the army, and purified the Senate and nobility. He himself lived in the most markedly simple and austere fashion. He was accused of meanness in money matters, but his frugality was personal; he was always generous in state expenditure. At the conclusion of the Jewish War, Vespasian had a joint triumph with Titus, and began to build a temple to peace. In A.D. 72 Kemmugène was annexed as a province to the Roman Empire, and Antiochos, its king, went to Rome to reside. Vespasian has been censured for the execution of Priscus the Stoic philosopher, but there may have been some reason for his severity. In A.D. 71 a census of the citizens was taken by Vespasian and Titus. In A.D. 78 Agricola went to Britain to reduce North Wales and Anglesea, whose inhabitants had revolted. In A.D. 79 the emperor ordered Sabinius and his noble wife to be put to death, because the former had assumed the title of Cæsar in Gaul, nine years before. Vespasian died on the 24th June, A.D. 79, after a reign of nearly ten years. He had the whim to die standing, supported by his favourite slaves. His good-tempered jocularity, a broad countenanced humour, was with him to the last. "Have a care," he murmured, "I am

about to become a god!" He was far too sensible a man not to laugh at the then prevailing custom of actually worshipping departed emperors. He was on the whole a wise and good emperor, frugal, temperate, affable, humble. His occasional acts of cruelty have left a stain upon his memory. But his faults were counterbalanced by his virtues as an emperor. He was succeeded by his elder son Titus.

**VES'PERS** (Gr. *Hesperos*, Hesperus or Vesper, the evening star), one of the seven canonical hours in the Roman Catholic Church, called also, in ancient times, *Lucernarium*, from *lucerna*, a lamp. It is a service of great antiquity, and continues to be sung as one of the ordinary services of parish churches, following unes and preceding compline; that is, in modern times, at about two or three in the afternoon. It consists of five psalms and antiphons, a lesson, a hymn with versicle and response, the Magnificat, and a collect or prayer. The evening service of the Anglican Church partly corresponds to vespers, and partly to compline. The massacre of the French in Messina and Palermo, historically famous as the *Sicilian Vespers*, was so called because it commenced at the ringing of the vesper bell at Palermo, Easter Monday, 30th March, 1282.

**VES'PERTILIONIDÆ** is an extensive family of BATS (Chiroptera). The Vespertilionidæ are widely distributed throughout the temperate and warm regions of both hemispheres. They are the most typical members of the whole order, nearly all the European bats being included in this family. They are devoid of leaf-like nasal appendages, the nostrils being simple round or crescent-shaped apertures at the extremity of the muzzle. There are generally four incisor teeth in the upper and six in the lower jaw; the canine teeth are moderate; the premolars are variable in number and size; there are three well-developed molar teeth on each side in both jaws, provided with sharp W-shaped cusps. The ears are moderate or large, disconnected at the lower part, and furnished with large tragi. The tail is long, contained in, and projecting slightly from, the inter-femoral membrane. The common British species are the Pipistrelle (*Vesperugo pipistrellus*), the LONG-EARED BAT (*Plecotus auritus*), the NOCTULE (*Vesperugo noctula*), and the SEROTINE (*Vesperugo serotinus*), which are separately noticed. Two other species of the genus *Vesperugo* have occurred in Britain. The Hairy-armed or Leisler's Bat (*Vesperugo leishii*) is widely distributed over Europe and temperate Asia. It has been taken occasionally in the midland counties of England and in Ireland. It is about 2½ inches in length, and is remarkable for a broad band of hair which passes about the wing-membrane at the under surface of the forearm. The Party-coloured Bat (*Vesperugo discolor*) is a rare species, found on the Continent, chiefly in Russia and Germany, and has only been taken once in this country. It is a little larger than the last species, and derives its name from the finely-marbled appearance of the fur, the tips of the hairs on the back being of a light-gray colour, while their roots exhibit a rich chestnut or deep brown hue; the hairs on the lower surface are gray at the base and white at the tips, and there is a reddish-brown patch on the middle of the chest and belly. The Barbastelle (*Synotis barbastellus*) is another rare British species, found only in the southern and midland counties of England; on the Continent it occurs chiefly in France and Southern Russia. The broad ears are united by their inner margins over the forehead, and the muzzle is short and truncated. It measures about 2 inches in length, and has a brownish-black, soft fur. The Mouse-coloured Bat (*Vespertilio murinus*) is the common bat of Central and Southern Europe, but has only been taken once in England. It is the largest of British bats (if, indeed, it can be considered a native), measuring upwards of 3½ inches in length. The fur is long and soft, pale reddish-brown above and grayish-

white beneath. The ears are as long as the head and oval in shape; the head is long, with a pointed muzzle. Its habits are gregarious, and it has a great fondness for old buildings. It feeds chiefly on moths, and is exceedingly pugnacious. The Reddish-gray or Natterer's Bat (*Vespertilio nattereri*) is common on the Continent, but has only been taken in the eastern counties of England, and occasionally in Ireland. It is scarcely 2 inches long, and is reddish-gray above and whitish beneath. It is, like the preceding species, gregarious in its habits. Three other species of the genus *Vespertilio* occur (rarely) in Britain. The Red Bat (*Atalapha noroncoracensis*) is the common representative of this family in the United States. It is a small species, measuring about 2 inches in length, and covered with a long silky fur, which exhibits various shades of red and yellowish-brown.

**VESPIDÆ.** See W.A.V.

**VESPUCCI, AMERICIGO**, an Italian navigator, from whom the name of America is derived, was born in Florence, 9th March, 1451. He was in business in Seville as an agent of the Medici family when Columbus returned from his first voyage; and in 1496, while fitting out four taravels for the Spanish service in the countries lately discovered, had some intercourse with Columbus, and was induced to prepare for a career of nautical adventure. In 1499 he sailed from Spain in an expedition under Ojeda, which visited the neighbourhood of Cape Paria, sailed along several hundred miles of coast, and returned in 1500. His MS. account of the voyage, written for one of the Medici of Florence, was discovered and published by Bandini in 1745. In May, 1501, he entered the service of the King of Portugal, and participated in an expedition which visited the coast of Brazil. Of this voyage he also wrote an account to the same member of the Medici family, which was first brought to light by Bartolozzi in 1789. In 1504 he sent to the same person a fuller narrative of this expedition, which was published at Strasburg in 1505, under the title "*Americus Vespultius de Ora Antarctica, per Regem Portugallie pridem inventa.*" From this voyage he acquired the reputation of being the discoverer of the mainland. In 1503 he again sailed on an exploring expedition, and made his way to the coast of Brazil, returning to Lisbon the following year. In 1505 he sought and obtained employment from the Spanish court, and in 1508 he became pilot-major, a post which he retained until his death, which took place at Seville, 22nd February, 1512. The claims of Vespucci to be the first discoverer of the mainland of America have been the subject of much controversy, but this did not arise until more than twenty years after his death; and there is no reason to suppose that he had any intention of taking the honour of the discovery from Columbus, with whom he was on friendly terms. The name *Americi Terra* was applied to the newly-discovered continent as early as 1507 by Waldsee-Müller, a geographer of Freiburg, in Breisgau, in a small work entitled "*Cosmographiæ Introductio . . . in super quatuor Americi Vespucci Navigationes.*"

**VESTA** (Gr. *Hestia*), one of the divinities, common both in name and mode of worship to the Greeks and Romans. According to Hesiod, she was the first-born daughter of Kronos and Rhea, and sister of Zeus; the Romans made her the daughter of Saturn and Ops. She was a maiden divinity.

Vesta was the goddess of the hearth, and as the hearth was the centre of the family, where the members met, conversed, and took their meals, Vesta was regarded as the goddess of domestic union. Strangers and friends were hospitably received at the hearth; suppliants sought safety and protection there. The fire on the domestic hearth was also regarded as the symbol of Vesta herself. Each political community, city, or state, had its public hearth, or altar of Vesta, on which a perpetual fire was kept burning.

When a state sent out colonists, they took from the hearth of the metropolis (the Greek name for the parent city) the fire which was to blaze on the public hearth of the colony. Larger communities than a mere town or city had likewise their public hearth and centre of union. Thus the common hearth of the Greeks was at Delphi, and that of the Latins at Lanuvium. It is interesting to remember that the worship of Vesta was the last to disappear under the ban of Christianity.

In Greece Vesta had few temples, because every house and every Prytaneum was regarded as her sanctuary. But at Hermione in Argolis she had a temple, though, like her temple at Rome, it contained no image of the goddess. The temple of Vesta at Rome was round, and stood in the Forum. It was open during the day. The temple contained the altar of the goddess, on which burned the eternal fire. The Vestals, or priestesses of Vesta, were persons of great consideration at Rome. See following article.

**VESTALS** (*Virgo vestalis*), priestesses of Vesta. The number of these priestesses, according to the regulations of King Numa, was four, two for each of the ancient tribes. Servius Tullius, or, according to others, Tarquinius Priscus, added two more, to represent the third tribe, or Luceres, and this number of six remained ever afterwards unchanged. In the earliest times they were chosen by the kings, but afterwards by the Pontifex Maximus, who drew by lot one out of twenty select virgins in the assembly. Parents had no right to oppose a daughter being devoted to the service of the goddess, except in three cases: first, if one of her sisters was already a vestal; secondly, if the parents had no more than three children; and, thirdly, if the father held one of certain high priestly offices. There were also certain conditions or qualifications for the office of a vestal. A vestal could not be younger than six nor older than ten years when chosen. From the moment that a vestal virgin was chosen and taken to the atrium of Vesta, she was emancipated from her father's power. A vestal virgin was obliged to serve the goddess for thirty years—ten years as a novice, ten as a priestess, and ten as an instructor of novices. At the end of this time they might unconsecrate (*exaugurare*) themselves, and marry. These virgin priestesses enjoyed at Rome the highest distinctions. They had an official residence in the Via Sacra, and an annual allowance. A lictor preceded their litter when they went abroad, and even consuls and prætors lowered their faces as they passed. Their power of intercession was great. They could set free any criminal whom they accidentally met.

Their duties were to keep the fire burning on the altar of Vesta, and regulate all things connected with the worship of the goddess. They were intrusted with the sacred deposit, whose secret was only known to them, and which was the pledge of Rome's prosperity. This was sealed with a jar and preserved in the innermost recesses of the temple, and only approached by the Vestals and the supreme pontiff. Very important state documents of secrecy, such as the wills of the emperors, confidential treaties, &c., were often placed in their hands. They had also to prepare the sacrifices on certain occasions. If the sacred fire was ever extinguished through the carelessness of a vestal, she was scourged by the Pontifex Maximus. They were bound to maintain their chastity, and incontinence was punished with death. The guilty vestal was placed alone in a subterranean vault, and the tomb closed and covered over with earth.

In 1835 a most interesting discovery was made by digging into the foot of the Palatine, namely, the whole foundations and lower walls, up to 12 or 15 feet high, of the famous *Atrium Vestæ*, the abbey of these classical nuns. This house and the temple adjoining were the best venerated spots in Rome. To this home of the Vestals, to this centre of Roman religious and political life, to this palladium of the ancient state; there was continual concourse. Thither

went emperors, priests, consuls, and all the highest functionaries of the empire, and, indeed, all who needed answer to petition, succour, peace, advice, or place. What the Eleusinian mysteries were to the Athenians the Vestal Virgins were to the Romans. In the hour of danger, need, fear, or trouble the minds of high and low turned instinctively to them, peacemakers, advisers, friends, benefactors, and priestesses. In their midst were preserved, and to their care intrusted, the penates of the city, the sacred Palladia, as Ovid calls them, or, as some think, the seven *sacra fotalia* enumerated by Servius. The office of a Vestal Virgin was no sinecure, and she was occupied with the ever-recurring details of an important and well-attended worship, and with good offices of the highest political significance. Hence the *Atrium Vestæ* was not occupied exclusively by the virgins, but was thronged with priests, ministers, agents (*fictores*), engravers, sculptors, sacristans, freedmen, of all of whom we have mention, to say nothing of the physician, the *archiater*, or chief physician, of later times. The men were lodged in buildings adjoining, while the women servants and attendants, maids of honour, &c., had their lodging in the Atrium itself. Round about were dwellings for the coachmen, grooms, and equerries, who had the chariots and horses ever ready at their order, for the Vestals attended every high state ceremonial. Nay, at times even the Roman Senate itself is known to have held its sittings in the Hall of the Vestals. Fragments of costly marbles, nine portrait statues of Vestals (probably of the Grand Vestals or abbesses of the sisterhood, *Maxima Virgo*), and parts of several other statues, &c., were found in this successful excavation. One excellent thing accomplished is the certainty, through these statues, of what the much-discussed Vestals' dress was. These statues show it quite clearly. For instance, we may describe one of the memorial statues of the Grand Vestals, of which the lower portions, from below the hips, and the forearms are wanting. In every other respect it is perfect. The face, which is singularly free from injury, is that of a woman of some fifty years of age, of calm, dignified, even severe expression—evidently a perfect likeness, replete with individuality, it being admirably modelled. The refined, slightly Roman nose and nostrils are delicately cut, as are also the ears, in carving which the sculptor must have had no little difficulty, because of the drapery falling from the head on to the front of the shoulders. The hair, with a slight division in the middle, is turned straight back in a complete roll of fully an inch in diameter, and at about half an inch behind that five folds or turns of the *infula* lie on the head one behind the other, like a cap made of cords, each as thick as a little finger. The rest of the head is covered with the *pallium*, which descends in front of the left shoulder and behind the right, and that side of it is then carried in large folds across the lower part of the body and over the left arm. On the head again, over the *pallium*, is a kind of wimple, which falls on to the shoulders and is fastened with a round brooch or *bolla* at the pit of the neck, and ends all round in a horizontal line, broken only by small folds. This is evidently the peculiar head-dress worn in sacrificing, called the *suffibulum*, and it is the only example of it these statues present. The *infula*, as these statues all show, was a plain roll—the material was wool—wound round the head several times, and then brought forward from the back in the form of loops, falling on to the breast, one from each side of the neck. But these loops would seem to have been an indication of rank in the order, for this vestal had a double loop on each side of hers, while others had single loops only, and some appear to have had the *infula* wound only round the head. The *stola* of Vestals were generally fastened round the waist by a cord similar to that worn by Franciscan nuns, and tied in front by a single bow with one loop; but on this statue the cord is tied in a knot with two short, loose ends.

**VESTMENTS.** At the institution of the Jewish priesthood, very minute instructions were given as to the manner in which they were to be attired during the performance of their religious duties. (See Exod. xxviii. &c.) The custom of the priests dressing differently to the people during worship was not, however, confined to the Jews, but was practised in nearly every religion of antiquity, and is continued in those of them which have existed to the present time. It is exceedingly doubtful whether the system was adopted in any way by the immediate disciples of Christ and the earliest teachers of Christianity: it is almost certain it was not, for it is believed on excellent authority that many of the garments which have been retained and are now worn exclusively by priests were originally merely parts of the ordinary dress of the people; indeed, the derivation of the very names of many of these vestments favours this supposition. As early, at least, as the fifth century, however, the clergy had assumed a distinctive dress during the celebration of divine service. The vestments to be worn in the Church of England under the existing canons (James I., 1603), by "ministers saying public prayers or ministering the sacraments or other rites of the Church," are "a decent and comely surplice with sleeves;" and for graduates, "such hoods as by the orders of the universities are agreeable to their degrees," with permission to "such ministers as are not graduated to wear upon their surplices, instead of hoods, some decent tippet of black, so it be not of silk." (See 58th Canon.) This canon is in accordance with the advertisements of Queen Elizabeth, and has been the governing rule in the church from the time of the Reformation, although by the introduction of the rubric immediately preceding the order for morning prayer, on the revision of 1662, a foundation was laid for the re-suscitation of the vestments in use prior to the second year of Edward VI., and of which the ritualists have availed themselves during the last few years. The rubric of the first Prayer Book of Edward VI. prescribed the use of the surplice, the hood, the rochette, the cope, the tunicle, the alb, and the pastoral staff. Besides these, the modern ritualists have revived various other vestments and ornaments in use in the church prior to the Reformation; but by the second Prayer Book of Edward VI. those permitted in the first are, with the exception of the bishop's rochette and the priest's surplice, interdicted in these words: "And here it is to be noted that the minister at the time of the communion, and at all other times of his ministration, shall use neither alb, vestment, nor cope; but being archbishop or bishop, he shall have and wear a rochette, and being a priest or deacon, shall have and wear a surplice only." The whole of the reforms of Edward VI. were swept away by a repealing Act of Queen Mary, but this Act was again repealed by 1 Elizabeth, c. 2, which revived the second Prayer Book of Edward VI., except as to the ornaments of the church and clergy. The introduction into the Prayer Book, incorporated in and made part of the Act of 13 and 14 Carolus II., c. 4 (1662), of the rubric restoring the ornaments of the church and the ministers thereof which were in use in the second year of Edward VI., was allowed to sleep for more than 200 years, but was at length seized upon to warrant the ritualistic practices which followed the Oxford movement in connection with the Established Church. In the celebrated Ridsdale judgment, in 1877, it was, however, decided that the only legal vestments in the English Church were the surplice or alb in ordinary churches, with the addition of the cope at the communion service in cathedral churches. The vestments used in the celebration of the Mass by the priests of the Roman Catholic Church are the amice, a square piece of linen anciently worn upon the head, but now placed upon the shoulders; the alb, a long, loose-sleeved gown of white linen; the cincture, a linen cord tied around the waist and

confining the folds of the alb; the maniple, originally simply a handkerchief, but now a narrow strip of embroidered silk worn pendent from the arm; the stole, a long narrow scarf similarly embroidered, worn by priests around the neck; and lastly the chasuble a loose vestment, open at the sides, having a hole in the centre, through which the head passes, and falling down over the breast and back to some distance below the knees.

**VESTRY** is that part of a parish church where the ecclesiastical vestments are kept; and inasmuch as meetings of parishioners in former times were usually held in this part of the church for parochial purposes, such meetings, duly convened, have acquired the name of vestries. Even where a building remote from the church has been erected for parochial meetings, it is usually called the *vestry-room*. When the meeting is held in the church, or even in a building within the precincts of the churchyard, the ecclesiastical courts claim jurisdiction over the conduct of the parishioners.

By the common law all rated inhabitants of a parish have a right, either periodically or when specially convened, to meet in vestry on the affairs of the parish, and to vote the necessary pecuniary rates. But this common-law right has been modified in many ways:—

1. By custom, which has vested the government of some parishes in a select and usually a self-elected body of persons. The principal Act for the regulating of these vestries is the 58 Geo. III. c. 69.

2. Section 20 of the Act 10 Anne, c. 11, gives to the commissioners appointed by that Act (for the purpose of erecting fifty new churches in London and its neighbourhood) power to appoint, under their seals, with the consent of the ordinary, "a convenient number of sufficient inhabitants, in each parish created under the Act, to form a select vestry of such parish." It vests in the majority of such select vestry the power to supply vacancies, and gives them all the powers of other vestries. The 59 Geo. III. c. 131, another church-building Act passed to explain and amend the Act of the previous session, gives a similar power (s. 30) to the commissioners under those two Acts to appoint, with the like consent, a select vestry; and the tenth section of the Act 3 Geo. IV. c. 72, confines the powers of the vestryman to his own district with respect to ecclesiastical matters, and provides that any deficiency in the select vestry shall be supplied as vacancies have hitherto been filled up in the vestries of the particular parish. Local Acts have also created vestries.

3. The 59 Geo. III. c. 12 (Sturges Bourne's Act) enables general vestries to appoint special vestries, consisting of not more than twenty parishioners nor fewer than five, to superintend the relief of the poor, the overseers of the poor being placed under their authority.

4. A fourth kind of vestry is created by 1 and 2 Will. IV. c. 66 (Sir John Hobhouse's Act). The adoption of this Act is left to the discretion of each particular parish; but rural parishes of less than 800 rated householders are excluded from its operation.

It is the duty of vestries to elect churchwardens; to present for appointment fit persons as overseers of the poor; to administer such estates and other property as belong to the parish; and in some cases, under local Acts, to superintend the paving and lighting of the parish, and to levy rates for those purposes.

The remedy for neglect of duty by a vestry is a mandamus from the Queen's Bench Division, directed to the officer whose duty it would be to perform the particular act, or in some cases by an ordinary process against him, or by a process against the churchwardens out of the ecclesiastical courts. By the Act 13 & 14 Vict. c. 57, vestries are not to be held in churches, and the same Act requires the appointment of vestry-clerks.

**VESUVIAN.** See IDOCRABE.

**VESUVIUS** (written also by the Roman poets *Vesérus* and *Vesivius*), a mountain about 6 miles east from the city of Naples, celebrated for many centuries as one of the principal volcanoes, and indeed the only active one of any consequence, on the continent of Europe. Its height above the sea is variable, according to the condition in which eruptions leave the crater. By the violent eruptions of October, 1822, the top was left as a vast elliptical gulf or chasm 3 miles in circumference, and perhaps 2000 feet in depth. More than 800 feet of the summit of the ancient cone was carried away by the explosions, and the height of the mountain was thus reduced from 4000 to 3200 feet.

Mount Vesuvius rises out of the fertile and luxuriant plain of Campania; its lower part is a sloping plain covered with stones, lava beds, and scorice, 3 miles in length, and rising to 2000 feet, above which a cone of volcanic ash extends to the summit. Around the mountain a larger number of simple minerals have been discovered than on any other similar area; and the vegetable products on its flanks comprise euphorbias and many other plants not found elsewhere in Italy. The vines which produce the famous wine called *Lacryma Christi* are raised on its sides. A wire rope railway was made to the summit in 1880.

The history of the eruptions of Vesuvius has been traced by several writers, especially by the late Dr. Daubeny, in his "Treatise on Volcanoes," and Sir Charles Lyell, in his "Principles of Geology." It does not appear that any record exists of an actual eruption of Vesuvius prior to the Christian era. In the month of August, A.D. 79, occurred the first and perhaps the greatest of all the recorded outbreaks, described in the letter of Pliny the Younger to Tacitus, which records the death of Pliny the naturalist. The cities of Stabie, Pompeii, and Herculaneum were overwhelmed by showers of cinders and loose fragments, no lava having been ejected on this occasion. Other eruptions succeeded in 203, 472, 512, 685, 993, and 1036, which last is said to have been the first attended by an ejection of lava. Eruptions were renewed in 1049, 1138, 1306, 1500, 1631, 1660, 1682, 1694, and 1698, from which time to the present they have occurred very frequently, so as seldom to leave any interval of rest exceeding ten years. The most celebrated during the last 100 years have occurred in 1779, 1794, 1822, 1834, 1850, 1855, 1858, 1861, 1865, 1867, 1868, and 1872. Sometimes this mountain has broken out twice within a few months.

The eruption of 1779 is described by Sir William Hamilton as among the grandest of these phenomena. White smoke like heaps of cotton rose four times as high as the mountain, and spread about it to a proportional extent. Into these clouds stones, scorice, and ashes were projected at least 10,000 feet high. On subsequent days red hot lava shot forth three times as high as the mountain, and large masses of rock were thrown out, one of which was 108 feet in circumference. The eruption of June, 1794, destroyed the town of Torre del Greco by a stream of lava estimated by Breislak to contain more than 46,000,000 cubic feet, which flowed into the sea in a mass 1204 feet wide and 15 feet high.

On 24th April, 1872, a great flow of lava succeeded an unusual outpouring of smoke and flame which had lasted for several months. A large tract of cultivated land was desolated, the villages of San Sebastiano and Massa were destroyed, and many lives lost. The streets of Naples were filled several inches deep with fine black sand.

**VETCH** (*Vicia*) is a genus of plants belonging to the order *LEGMINOSÆ*, suborder *Papilionacæ*, and tribe *Vicieæ*. The species are numerous, widely distributed through the temperate parts of the world, and occasionally found in mountainous districts in the tropics. They are mostly weak climbing plants, with pinnate leaves terminating in tendrils, and having pinnate stipules at their

base. The genus is distinguished by the character of the style, which is cylindrical, with a tuft of hairs on the under side, or with a slight downy ring around the stigma. To this genus is generally referred the Common BEAN (*Vicia Faba*), though some make it the type of a distinct genus, *Faba*.

The Common Vetch (*Vicia sativa*), or tare of agriculture, is widely cultivated as fodder for cattle, and is found in dry pastures, open woods, and waste places throughout Europe and Russian Asia. In cultivation it is an annual or a biennial, according to the time of sowing. The stems are from 1 to 2 feet in length; the leaves have from eight to fourteen leaflets, varying in shape from linear to obovate, notched and pointed at the apex. The flowers are large, reddish or bluish purple in colour, sessile, solitary, or rarely in pairs. The pod contains ten or twelve smooth globular seeds. Vetches or tares are a very important green crop in the improved systems of agriculture, especially on heavy soils, where they thrive best. When sown in autumn, with a small sprinkling of wheat or rye, they cover the ground in spring, and supply abundance of fodder in summer. A good crop of tares is fully equal in value to one of red clover. By sowing them at regular intervals from September to May, a succession of green tares in perfection, that is, in bloom, or when the pods are formed, may be cut for several months, from May to October. The seeds are a favourite food with poultry and pigeons. *Vicia angustifolia* is merely the wild, as distinguished from the cultivated, species; its leaflets are narrower, its flowers smaller, and the pod shorter. Several other species of vetch are found in Britain. The Tufted Vetch (*Vicia cracca*), common in hedges and bushy places, is a perennial, the annual stems climbing by means of the branched tendrils to the length of 3 feet. It has numerous fine bluish-purple flowers. The Wood Vetch (*Vicia onychia*), found in hilly wooded districts in Britain, is a handsome species, climbing over shrubs and small trees, sometimes to the length of 6 or 8 feet. It has long drooping flowers, white, streaked with blue. The Bush Vetch (*Vicia sepium*), common in woods and shady places, is a perennial, but not of a climbing habit; it has light reddish-purple flowers. The Hairy Vetch (*Vicia hirsuta*), common in hedges, cornfields, and waste places, is an annual, with pale blue flowers. Five other species are British. Some of these species are occasionally cultivated as fodder. *Vicia biennis*, a native of Siberia, is cultivated in some parts of Europe, as it is very hardy, continuing green through the winter, and furnishing an early fodder.

The name Vetch is also given to some species of the allied genus *Lathyrus*. The Bitter Vetch is *Lathyrus pratensis* (formerly *Orobanchus pratensis*), whose perennial root forms small tubers, which are eaten in Scotland and on the Continent; in the Highlands of Scotland a kind of liquor is also made from them. It is abundant in Britain in thickets and open woods, under hedges, &c. Vetchling is the name often given to *Lathyrus sativus*, a species cultivated on the Continent for its edible seeds, and also for fodder.

**VETERINARY MEDICINE** (Lat. *veterinarius*, pertaining to domestic animals) is that branch of medical science which embraces the treatment of diseased domestic animals, and the study of the best means of preserving their health. Veterinary medicine was studied among the ancient Egyptians, Arabs, Persians, and Hindus, and it attracted considerable attention among the ancient Greeks. The Greek physicians were expected to undertake the cure of animals as well as men, and the "father of medicine," Hippocrates, wrote a treatise on the curative treatment of horses. A few centuries later we find systematic studies of veterinary medicine among the Greek writings, while the Latin authors, Columella and Vegetius, the latter of whom flourished about 300 A.D., wrote upon the subject,

and in their treatises epitomized the best of the works of their predecessors. The science was virtually lost in the destruction of the Roman Empire, and only began to revive again in the sixteenth century, when by the order of François I. the Constantine collection of works were translated from the original Greek into Latin, and were afterwards re-translated into Italian, French, and German. In 1618 Carlo Ruini published at Venice his illustrated work on the anatomy of the horse, and this was followed in 1651 by the work entitled the "Grand Mareschal François." In England, during the reign of Elizabeth, Blundeville and Gervase Markham published works on farriery, and Snape, farrier to Charles II., published an anatomical treatise on the horse, copying his plates from Ruini. The eighteenth century produced numerous authors on veterinary medicine, one of the best of the English works being "The Farrier's Guide," written by Gibson, who had been at one time surgeon in a cavalry regiment. But little real progress in the scientific study of the art was made, however, until 1762, when the prevailing epizootics among farm animals led to the establishment, under royal patronage, of the Veterinary College at Lyons under Professor Bourgelat. In 1766 another school of veterinary medicine was established at Alfort, near Charenton, and similar institutions were soon afterwards founded in every country in Europe. In 1791 the Veterinary College of London was instituted under the presidency of the Duke of Northumberland, Charles Vial de St. Bel being appointed principal, with Delabere Blaine as assistant-professor. In 1819 the first course of lectures on veterinary medicine in Scotland was delivered by Mr. Dick, and four years later the same gentleman began his system of teaching of veterinary surgery under the auspices of the Highland and Agricultural Society and the *Scottish Academician* of Edinburgh. Soon afterwards he erected the college buildings in Clyde Street, Edinburgh, to which he attached an hospital for sick animals and a valuable museum. At his death in 1866 Mr. Dick bequeathed to the city of Edinburgh the college he had founded, together with his entire fortune, to be devoted to the teaching and improvement of veterinary medicine. In 1857 a new veterinary college was established in Edinburgh by Mr. John Gamgee, and since 1861 a veterinary school has been conducted in Glasgow also.

In the present century the earnest study of comparative anatomy and physiology, and the careful investigation of animal diseases, and of the contagions and parasites which are intercommunicable among the lower animals and between them and man, have opened up a new path of usefulness for veterinary medicine, advanced the science of comparative pathology, and added a most valuable chapter to the doctrine of prophylaxis. As at present existing, veterinary science embraces the anatomy, physiology, hygiene, dietetics, and general care of domestic animals, together with their diseases, therapeutics, and prophylaxis, the philosophy of breeding, shoeing, sanitary principles of building, drainage, and ventilation, the influence of soils and seasons on the food, water, and air, the effects of climate on the animal economy, the laws of contagion, the development and metamorphoses of parasites, and numerous other subjects.

With respect to the practice of veterinary medicine, the law relating to the subject is governed by the Veterinary Surgeons Act of 1881 (44 & 45 Vict. c. 62), which made provisions for the registration of members of the Royal College of Veterinary Surgeons, and for the accurate keeping and amending from time to time of such register. Persons who, at the time of the passing of the Act, had been in continuous practice for not less than five years without being on the register, were entitled to be placed on a separate register as "Existing Practitioners," without examination. Any unqualified person taking or using the

title of Veterinary Surgeon or Veterinary Practitioner, or any name or title stating that he is such, renders himself liable to a penalty of £20, and he is not entitled to recover any fees or charges in a court of law. In the army, a veterinary surgeon is an officer of an artillery or cavalry regiment who is charged with the supervision of the horses, and with their treatment when sick. Before being appointed he is required to produce evidence of his qualification, and to pass an examination. He takes rank as a lieutenant, and receives at the commencement 10s. a day, his pay rising with length of service and efficiency to £1 3s. a day, and his rank to that of major; retirement on half-pay is granted at the end of twenty-five years' service.

**VETIVER** or **KHUS-KHUS** are the names given to the dried roots of a grass, *Andropogon muricatus*, used to make fans, mats, covers for palanquins, &c., which retain for a considerable time a most agreeable odour. See **ANDROPOGON**.

**VE TO**, in politics, the power of one branch of the legislature to reject or negative the propositions or resolutions of another branch. In the United Kingdom that power is enjoyed by the sovereign, who can veto any bill passed by the two Houses of Parliament. It is, however, only employed in great emergencies, and the last occasion on which it was exercised was in 1707, when Queen Anne vetoed a bill in reference to the Scotch militia. In respect to money bills the House of Lords can only exercise a veto, not being permitted to propose any modification; and it employed its prerogative in 1859 to defeat the repeal of the paper duty when first proposed by Lord Palmerston's ministry. The House of Commons, in like manner, can only veto, not alter, any bills relating to the peerage. In the United States of America the president can veto all laws proposed by Congress, but any bill thus rejected may be passed over his head (as was done on several occasions during the presidency of Mr. Andrew Johnson) by a majority of two-thirds in each House of Congress.

**VE TO ACT**, the name given to a celebrated law passed by the Established Church of Scotland, for the purpose of preventing the intrusion of a minister into any parish contrary to the will of the congregation. It was first proposed in the General Assembly of 1833 by Dr. Chalmers, but was not passed until the Assembly of 1834. The old constitutional practice of the church required that the presbyter should obtain a call or invitation from the people, to undertake the office of pastor over them; and it was affirmed that the spiritual act of ordination was grounded upon this invitation alone, and not upon the presentation of the patron. The evangelical and reforming party in the church believed that they possessed the power of determining the nature and amount of popular concurrence which was necessary, before the pastoral relation was formed between the minister and the people by ordination. And they laid it down as an essential principle that no clergyman ought to be settled in a parish contrary to the wish of the people. The veto law which embodied this principle enacted, that in every instance the dissent of the majority of the male heads of families, being communicants, should be a bar to the settlement of a minister. The power of the church to pass such a law was speedily challenged, and the question was tried before the civil courts. In the parish of Auchterarder, containing 3000 souls, only two persons signed the call to the presbyter, Mr. Young, while 287 out of 300 communicants dissented. He was consequently rejected by the presbytery; but the patron, the Earl of Kinnoull, and the presbyter brought the case before the Court of Session, and, by a majority of seven against five judges, that court decided that the Veto Act was illegal. This decision was confirmed on appeal to the House of Lords. Other similar cases speedily occurred, and were decided in a similar manner, and the collision which in consequence took place between the

civil and the ecclesiastical courts ultimately caused the disruption of the church in 1843.

On the secession of the 474 ministers who founded the Free Church, the Veto Act was declared by the remnant to be unconstitutional and illegal, and was at once set aside. But a new Act was soon afterwards introduced into the House of Lords by the Earl of Aberdeen, and passed into a law, empowering the presbytery to give effect to any objections the people of a parish might bring against a presentee, and to set him aside, provided the members of the presbytery should find the objections valid. Patronage was abolished by an Act of Parliament in 1874, and the right of choosing a minister was transferred to the congregation, the patron receiving compensation to the extent of one year's stipend.

**VEVAY**, a town of Switzerland, in the canton of Vaud, beautifully situated 12 miles east of Lausanne, on the north shore of the Lake of Geneva, with about 7000 inhabitants, who manufacture leather, woollens, and jewelry, and carry on a considerable trade in wine. It is regularly built in the form of a triangle; has spacious streets, and a large market-place lined on three sides by handsome buildings, and on the fourth planted so as to form a fine promenade. Its chief buildings are hotels and *pensions* for its numerous visitors, but it has a college, public library, corn magazine (with eighteen marble pillars), town-house, hospital, &c.

Ludlow, one of the judges, and Broughton, who read the sentence condemning Charles I. to the scaffold, resided here as exiles, and are interred in St. Martin's Church. At the extremity of the lake stands the Castle of Chillon, on a rock close inshore, rendered memorable by Lord Byron's poem, "The Prisoner of Chillon." The castle is now used as a magazine for munitions of war. The neighbourhood is described in Rousseau's "Nouvelle Héloïse," which greatly helped to bring Vevay into notice. The population of Vevay is 8000.

**VEXIL' LUM**, the Roman cavalry standard. The first standard was a bunch of hay tied to the end of a spear, to serve as a rallying point. The next was the vexillum, a square piece of cloth hanging from a transverse rod, which was fixed cross-wise, very nearly at the point of the standard pole. This served for all standards till Marius introduced the ever-memorable eagle (silver or gold) as the standard of the entire legion, and the custom grew up of leaving out the flag of the vexillum, and of decorating the bare poles with circular discs arranged down it beneath the eagle, and commemorative of distinguished actions (like the battle names on our own military ensigns). After this time the vexillum was the cavalry standard alone, or that of small bodies of infantry, divisions of the legion.

**VIA**, one of a set of foreign bills, usually drawn in sets of three, to facilitate their negotiation and for safety in transmission. Upon any one, *via* being accepted, the others become useless, and are withdrawn by the acceptor as soon as they reach his hands. If there is only one bill in the set it is called a *sola*. There may be copies made of a *sola*, it is true, for convenience of negotiation, but these differ from *vias*, each one of which is of equal authority till one of them is selected for acceptance, whereas copies of a *sola* are mere conveniences, and are rarely themselves negotiated.

**VIADANA, LUDOVICO** (1565-1645), is noteworthy in the history of music as having composed the first piece in the form of solos with instrumental accompaniments in church music, usually supporting his voices with the organ or with a small band. When he used the organ he played from figured bass, and was the first to habitually compose harmonies in this way, instead of writing concurrent and harmonizing melodies; in short he was the first composer to use harmony rather than counterpoint. From his great use of the art figured bass has been usually credited to him



as his invention. This is now known to be incorrect. What is quite certain is, that he was the first to appreciate its power and to make it really serviceable in the art. Viadana was a monk. He was born at Lodi, learnt his art at Rome, and became famous at Venice and at Mantua, where he died.

**VIATICUM** (literally fare or money and other provisions for the journey), the Host, when administered to the dying in the Roman Catholic Church, as if it were a passage-price into the next world.

The *viaticum* of Roman history was a very expensive affair; it comprised the outfit and expenses of those great viceroys whom Rome sent as proconsuls, prætors, &c., to govern her provinces. Usually contractors provided the viaticum for an agreed sum. till Augustus, to end the perpetual quarrels, made it a money payment.

**VIATKA**, a town of Russia, the capital of the government of the same name, situated in a beautiful district at the confluence of the Viatka and the Chlenopka. There are numerous churches, all of stone, two convents, diocesan and high schools, a gymnasium, extensive distilleries and ironworks, and leather, wax, stearine, and candle factories. Some of the inhabitants are gold and silver smiths, but a considerable number live by agriculture. The total population is 24,000, who carry on an active trade. The town is mostly built of wood, and is the seat of government and the see of a bishop. The cathedral has some very costly decorations.

**VIborg**, a seaport town of Finland, in European Russia, the capital of a government of the same name, situated at the head of a deep bay of the Gulf of Finland, 75 miles north-west of St. Petersburg. It is connected by canal with Lake Saima and the great lacustrine district of Finland; and is a place of considerable strength, well built. It has Lutheran, Greek, and Catholic churches, a gymnasium, military hospital, and a trade in tar, tallow, and timber. Population, 9000.

**VI BORG**, one of the oldest towns of Denmark, in Jutland, on a lake of the same name, 38 miles north-west of Aarhus, with a fine old cathedral, a state-house, arsenal, superior school, and a considerable trade. Population, 7000.

**VIBRA'TO**, a trick in singing, disastrously on the increase; a rapid trilling wavering utterance of the notes, imitating the "close shake" on the violin. It is supposed to give pathos to the voice, but in reality it has the same effect upon the ear as a flickering light produces on the eye. Singers who cultivate it are soon punished by being unable to sing a note without it, so that all definition is lost, and their purity of intonation is blurred. When the voice wavers between a note and another slightly sharp to it, it is in fact artificially producing dissonance, the first element towards unmusical noise, and it gives precisely the effect of two jarring notes, which "beat;" and "beating," as said above, is an acoustical "flickering."

**VIBRA'TION or VIBRATORY MOTION** is either a certain marked and particular mode of motion, or a combination of several separate motions of this particular mode. This is the mode of motion which is called a *simple vibration*. A simple vibration is not merely a swing backwards and forwards, but it is a swing regulated by a certain law, increasing from a zero point to a point of greatest rapidity, and then decreasing again to zero; and since this is the character of the oscillations of a pendulum, simple vibrations are also often called *pendular vibrations*. A simple or pendular vibration is best imagined in this way. Let the point  $r$  revolve uniformly round the circle  $A B C$ , while the point  $p$  travels to and fro along the diameter  $A C$  in such a manner that  $r p$  is always perpendicular to  $A C$ . Then the motion of  $p$  will be a simple or pendular vibration. At the start from  $A$  the point  $p$  will scarcely move, whereas at the centre  $b$  the point  $p$  will be moving as fast as the point  $B$ .

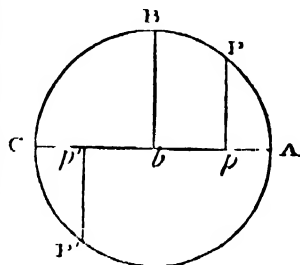
As the point  $r$  nears  $c$  and gets on the steeply inclined descent,  $p$  will slacken in speed until, as the two points coincide in  $c$ , the motion of  $p$  is zero. After an instantaneous stoppage, during which  $r$  has passed onwards,  $p$  begins to travel back, slowly at first, towards  $A$ ; so that when the first point is at  $r'$  the second is at  $p'$ ; and precisely the same phenomena occur, in reversed order.

For this reason continental physicists often call the path from  $A$  to  $c$  a vibration, and that from  $c$  to  $A$  a second vibration; but this is evidently an error, for both the outward and homeward path of the vibrating particle must manifestly be considered together.

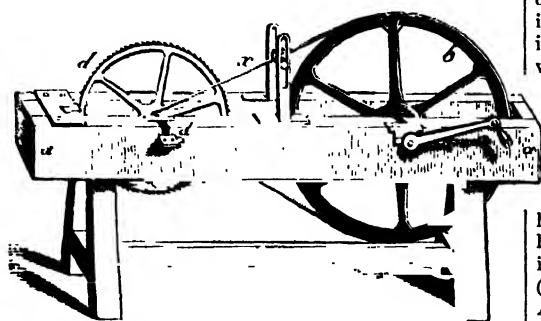
The theories of sound and light (and we may add heat and electricity) are built up on the considerations of the vibrations of a perfectly elastic fluid, these vibrations being either simple vibrations or combinations of such. Beyond this there is a principle of much service, called the *superposition of vibrations*, which applies to vibrations of very small extent. If distinct sets of small vibrations of this character be given to a solid or fluid system, then the resulting displacement of the particles will be very nearly the sum or difference of the various vibration-systems acting on the particle at the given moment, the sum if they both tend to displace it in one direction, the difference if their tendencies are opposite. This is not strictly true in any case, but it is near enough for practical purposes if the vibrations are small in extent (i.e. when  $A C$  is short in the figure), and becomes the more nearly true the smaller the vibrations are. For instance, two stones are dropped into water at two different places, and at a certain time and place the two sets of waves cross. Where crest meets crest the wave will be practically doubly high; where crest meets trough there will be interference, dead level; where trough meets trough there will be a double depression. Thus the effects of the two waves travel on without being annulled by their contact, and each system is quite traceable through the actually resulting alterations. Thus in fig. 3, Plate I., the waves  $a$  and  $b$  added together give  $c$ ; and if  $d$  be now further added we have  $e$  as the result of all three together. A wave is the form of a complete set of vibrations of adjacent particles, each particle being one phase more forward in its vibration than its neighbour. During the time that the wave moves forward one wave length, each particle will have traversed exactly one vibration. The wave is, so to speak, the vibration transferred from the diameter to the circumference; and such a vibratory motion as was represented in our figure above would take the form of a curve of contrary flexure composed of two half-circles.

Vibrations of sound are so much slower than those of light or even of heat, that we can examine them with ease. We cannot, it is true, trace the vibration of any one molecule of air, but we can accurately trace the path of the vibrating substance, which throws the air into sound waves; and that is a great advance towards real knowledge of the nature of sound.

The first thing we find is that no matter how we arrive at a given rate of vibration (say 256 vibrations per second, each vibration containing a pulse of condensation and a pulse of rarefaction), whether the sounding body be a string, a column of air (as in a pipe), a reed, a plate of metal (as in the cymbals), a membrane (as in a drum), &c., the pitch of the sound, which is the main feature of it, is the same. This point is already touched on in the



article *ACOUSTICS*, and one of the principal means of proving its truth, by providing an accurate method of counting vibrations, is described and figured under *SIRENS*. Another is the well-known toothed wheel of Savart, shown in the accompanying figure, where the wheel *b* is driven



Savart's Toothed Wheel.

by the handle *a*, and its speed of rotation measured by the counter *c*. The teeth of the toothed wheel *d*, driven very fast by its spindle, catch against a small quill or ivory slip, as shown, and as the number of the teeth in *d* is known, and the rate of its rotation is also known, the number of clicks per second can be accurately computed. But, as with the siren, the separate puffs of air are absorbed as soon as sufficient rapidity is attained and manifest themselves solely as sound, so is it with the toothed wheel, the clicks are heard no more when a good speed is reached, but a somewhat harsh musical note reaches the ear, the pitch rising and falling as the operator increases or diminishes the speed of rotation. If he succeeds in turning *b* steadily at a high rate the sound remains steady in pitch.

The *violin* (see Plate I.), which is a development from such rude instruments as the *crwth* (fig. 2), gives us the most perfect form of the vibration of strings. Here the strings, stretched firm end to end, are divided into two unequal lengths by the bridge *A*, one part, *n*, lying towards the "scroll" *c*, being free to vibrate; the other part, *b*, beyond the bridge, being loaded with a mass of horn, the "tail-piece" *E*; and since all the strings are attached to *E*, it follows that this portion below the bridge cannot vibrate, the motion of any one string being at once neutralized by that of the other three. The bridge is therefore set into vibration only by the part *A B C* of the strings, when the bow is drawn across them between the points *A* and *n*. When the bridge *A* vibrates the vibrations are taken up by its "feet," *t* and *g*, which rest upon the "belly" or sound-board of the instrument, and which therefore throw that in its turn into the like vibration. Finally, the sound-post, a small cylinder of wood inside the body of the violin, touching both soundboard and back nearly underneath where the foot *a* stands, transfers the vibrations of the soundboard to the back, and so throws the whole mass of *a* in the body of the violin into vibration, and converts it into a resonance chamber.

We have here four forms of vibration—that of the strings, that of the elastic plates forming the belly and back, that of the inclosed column of air, and that of the sound-post. These we shall now consider briefly in turn.

Now, as regards the vibration of the strings, if a thin sheet of light be produced by passing sunlight or electric light, &c., through a narrow slit, and be allowed to strike upon a grain of starch stuck on the string, so that the string cuts the plane of light vertically, then a luminous dot will be seen; and if the string be now set into vibration, we shall find that it by no means vibrates in a horizontal plane, although the motion of the bow which sets it vibrat-

ing is horizontal. It will vibrate, as shown by the luminous point, in one of the beautiful figures shown at figs. 5-13, which stand out as solid as the curves produced by boys with a whirling firebrand.

In the article *ACOUSTICS* the relation between the length of a sounding-string and the pitch of the note it produces is fully considered. The lowest tone a string can produce is there said to be the note given by its vibration as a whole. There is, however, a very ingenious method of making a string give forth a note considerably graver than its fundamental tone. Let an edge *D* (fig. 1) be placed beneath a string *A B C*, which is plucked by its middle point *B*. Then *A B C* would give forth its fundamental tone, were it not for *D*. But when it strikes *D* it breaks into two vibrating sections, *A E D* and *D F C*, which being each half the length of *A B C* will vibrate twice as quickly. Following the path of the string from the horizontal *A B C*, as it vibrates we find it passes from *A B C* to the horizontal (half a vibration); then it divides and reaches the form *A E D F C*, and returns to the horizontal, which at a double rate of vibration will be done in the time which we have called half a vibration; then it returns to the position *A B C*, another half a vibration—total, one and a half vibrations. That is to say, *D* will be repeatedly struck in  $\frac{3}{2}$  of the time required for the vibration of the string as a whole. But this gives a note graver than the note of a string by the Fifth below, the ratio of that interval being 2:3.

As regards the vibration of the plates of wood forming the soundboard and the back of the violin, these may be best studied by observing the behaviour of vibrating plates of metal or glass in the manner first used by the famous acoustician Chladni in 1785. Chladni set his plate in vibration, after he had fixed it by the centre with a clamp, by drawing a fiddle-bow across the edge near one of the corners. Instantly some fine sand he had strewn upon the plate heaped itself up (as shown in our Plate II., fig. 1) along the lines of rest, or *nodal* lines. The plate is here vibrating in four sections, + answering to +, and - to -, and gives out its deepest tone. As the section + rises the section - falls. The finger nail must "damp" the plate by touching it at the middle of one side. But if the plate be bowed at the middle and damped at the corner a note a fifth higher than the last is produced, and the nodal lines are as in fig. 2. If we clip the plate in the middle of a side, and bow at the adjacent corner, we get fig. 3. By shifting our point of fixture, our places of bowing and damping, we can produce an almost infinite variety of modes of vibration, some of which are shown at figs. 4-18. Professor Tyndall remarks ("Sound," p. 144), "It is not only interesting, but startling to see the suddenness with which these sharply defined figures are formed by the sweep of the bow of a skilful experimenter."

Passing to circular plates, if we bow at a certain point and damp at a point 45 degrees off, we get fig. 19; if our bowing and damping are but 30 degrees off, we get fig. 20; and 22½ degrees' distance gives us fig. 21. Leaving the centre free and clamping near the edge, we get fig. 22 and its successors; and here also, as our Plate shows, the variety of figures is practically infinite. A series of plates of other contours—hexagonal, oval, triangular, &c.—with their peculiar vibration figures, will also be found engraved in Plate III. All these vibration systems can be produced with a little practice.

As regards the vibrations of the column of air, this subject has been considered in the article *ORGAN PIPES*. Like the vibrating plates just considered, so also does a vibrating air-column divide itself into nodes and ventral sections. Figs. 18-21, Plate III., show by the position of the arrows the motions of the vibrating molecules for one node and for two nodes, and we see at a glance how the immobility of the nodes is secured by either a strain or a pressure equal on both sides.



There remains only one mode of vibration given in our typical sound-producer, the violin, which we have not yet examined. That is the vibration of the sound-post. This is an example of the longitudinal vibrations of a rod; and it may be exemplified by fig. 17, Plate III., where a rod connects two equal discs, and it is found that whatever vibratory motion is imparted to the one disc is at once shared by the other, the rod conveying the impulses. Like transverse vibrations, so also longitudinal vibrations may be excited in rods or bars or plates. Then if fine sand be strewn on the surface it will mark nodal lines, though not with that vigour which is shown in sand strewn on a transversely vibrating plate. If the flat bar shown on Plate I. be thrown into longitudinal vibration by rubbing its under side near either end with a wet cloth, or by rubbing a small rod or cylinder cemented on to its end in the direction of its length, or in any such way, we shall get the figures shown in the plate at A. Now turn the plate over and the figures will no longer be in the same plane; they will be as at B, falling on the points just intermediate to the nodal points of the other side. Similar results are shown with circular, square, and triangular plates, one side vibrating (longitudinally) as A, and the other side as B. In very narrow bars the nodal lines are straight across, and not curved, as in the figure.

But when we desire to examine the longitudinal vibrations of a rod or cylinder (Plate III.) we are met by the difficulty that dry sand will not rest on the surface. It is necessary in this case to use loose rings, as in the figure (22), which rings are shaken to and fro as the rod vibrates from end to end, when it has been rubbed lengthwise with a wet cloth, till they come to nodal points where they can rest. If their points of rest be marked, a very unlooked for result occurs on rotating the rod exactly half-way, so that the upper surface is now the under. The nodal points are alternate on the two surfaces, just as we saw they were in plates. Then let the cylinder be rotated less and more than before, and the locus of all the nodal points found, and we find this locus to be a sort of spiral whose course is not continuous, but breaks at  $n$  on one side of the central point, and goes on again at  $n'$ , a point equidistant on the other side of the centre, but in a *contrary direction*, so as to form on the two moieties of the length of the cylinder a right and a left-handed screw. The spiral is not equally inclined in its path, but waves as in the figure, thus dividing the cylinder into four quadrantal sections. Of these, two opposite ones, 1 and 3 (or say the upper and under edge), are divided by the nodal lines in points  $n_1, n'_1, n_2, n'_2$ , and  $n_3, n'_3, n_4, n'_4$ , where their inclination is a maximum; and the others, 2, 4 (which we may call the sides), at  $n_2, n'_2, n_3, n'_3$ , and  $n_4, n'_4, n_1, n'_1$ , where it is a minimum. In the case of a cylinder we find the nodal lines of the interior surface run along courses precisely alternate with the nodal lines of the exterior surface.

The longitudinal vibration of rods gives a very much more acute sound than the ordinary transverse vibration. The sweet (transverse) vibrations of a tuning-fork and the piercingly acute shriek of a scratchy slate pencil are familiar instances which at once occur to the mind as a rough proof of this assertion. For further particulars of the musical vibration of rods see TUNING-FORK. For the consideration of series of vibrations in the form of WAVES, see that article.

**VIBRATION MICROSCOPE** is the name given by the famous Helmholtz to a piece of apparatus for observing the curves of a vibrating string, constructed by himself on a principle first pointed out by Lissajous.

Take a large tuning-fork, and to one prong fasten the object-glass of a microscope (the remainder of the microscope being in place, but cut off from the object-glass) and to the other prong fix a counterbalancing weight. Then

any luminous point observed through the microscope when the fork is set into vibration will appear to move in a vertical line, the fork being arranged horizontally. For it is easily proved that an object viewed through a pocket lens moved to and fro in front of the eye, will seem to move. If, now, the luminous point be a grain of starch, &c., upon a violin string, strongly illuminated, and if the violin be held vertically, then the string when sounded will vibrate, and the luminous point will describe a horizontal line, and will so appear when viewed through the vibration microscope at rest. But if the fork of the vibration microscope be set in vibration, and the string be also made to sound, then the vertical motion of the one will combine with the horizontal motion of the other in a closed curve.

It is necessary that the violin string shall vibrate at the same rate as the fork, or at two, three, or four times the rate, &c. When these ratios are very close though not exact (indeed it is almost impossible to make them so), the curves slowly change before the eye, precisely as if they were drawn on a rotating transparent cylinder, and a very little practice will enable the observer to see from them the real motion of the violin string itself.

By adjusting an electro magnet with its poles one each side of the prongs of the tuning-fork, and arranging matters so that the prongs, as they vibrate, shall make and break the current (a wire dipping in and out of a mercury cup as it is drawn to and fro by the vibrating prong, is the usual method of connection), then the fork, once set into vibration, is kept vibrating for any desired length of time by means of the automatic action of the electro-magnet, since the fork not only makes the magnet, but is itself magnetic, and is attracted by the magnet which it has made. Its vibrations are, moreover, kept at precisely the same strength by the controlling action of the magnet—a point of no little convenience to the observer.

**VIBRATOR**, a very usual name for the *free reed* used in harmoniums and American organs (reed organs). See REED.

**VIBURNUM** is a genus of plants belonging to the order CAPRIFOLIACEÆ. About eighty species are known, natives of the temperate and subtemperate parts of the northern hemisphere, with a few in the West Indian Islands and Madagascar. They are shrubs or small trees, with opposite, simple leaves, and numerous small white flowers in large terminal cymes. The flower has a minutely five-toothed calyx; a wheel or bell shaped corolla, with a five-lobed limb; five stamens inserted in the tube of the corolla; and an ovary, one to three-celled, with a short three-lobed style. The fruit is a one-celled, one-seeded drupe. The Laurestine (*Viburnum tinus*), now so common throughout Europe and a very general inhabitant of the gardens of Great Britain, is a native of the south of Europe and the north of Africa. It was introduced into England in 1596. Its ancient name was *Tinus*, and from its resemblance to the Laurel, *Laurus*, it was called *Laurustinus*. There are several varieties of this plant known in gardens. All the varieties are hardy shrubs, evergreen, and bear the climate of Great Britain well; most of them blossom from November till April, and sometimes during May and June. It is valued as an ornamental shrub from its evergreen foliage and clusters of white flowers, and is particularly used as a standard for hall or conservatory decoration. *Viburnum lentago* (the sweet viburnum or sweet berry) is a native of North America, and found in hedges and on the borders of woods from New England to the Carolinas, and also in Canada. It grows sometimes to a height of 20 or 30 feet, and is a very beautiful plant with edible fruits. *Viburnum lantana* (the wayfaring tree) forms a shrub or low tree, and is a native of Europe and the west of Asia, in low woods and hedges, and chiefly on calcareous soils. In England it is not uncommon as far north as York; where found in the north of England and Scotland it has pro-

bably been introduced. When cultivated it forms a handsome, much-branched shrub, rising from 18 to 20 feet in height, with large broad leaves, corymbs of white flowers, and first green, then red, and then black oblong berries. The young shoots and leaves are thickly covered with a soft mealy down. The latter yield with alum a yellow dye; the berries are astringent, and are used in Switzerland in the manufacture of ink. The wood is white and hard, and is useful for turnery. *Viburnum opulus* (the Guelder rose) is a small tree, rising from 6 to 12 feet in height, with bright green leaves in summer, but in autumn assuming a beautiful pink or crimson hue. It is native throughout Europe, and is especially frequent in Britain and Sweden. In a wild state it is not remarkable for the beauty of its flowers, but its beautiful bunches of red berries render it a very attractive plant in the autumn of the year. The Guelder rose seems to have derived its name from growing in the low countries, in Guelderland, where it was first planted and its flowers developed in all their beauty. See GILLIES ROSE.

**VICAR** (Lat. *vicarius*, a deputy), a beneficed clergyman in the Church of England, who receives only the small tithes. A rector usually takes both great and small tithes, but when at the Reformation many rectors were appointed to the vacant livings, who were not themselves clergymen, they had to appoint *vicars* or deputies. To provide properly for these deputies the rectors were compelled by law to allow them a glebe and the small tithes—i.e. all others than those on corn, hay, and wood. The title is now extended to cover "incumbent," &c., so that it becomes not uncommon to find a vicar depending upon pew-rents, donations, &c.

In the French church the term *vicaire* answers rather to our curate, and the term *curé* to our vicar, or to be more accurately, to our rector. In this case the original sense of deputy is more clearly preserved to vicar than with ourselves, the French *vicaire* being a deputy for an ecclesiastic, the English vicar a deputy for a layman, the latter also in many cases having long since disappeared.

**VICARAGE.** See BENEFICE.

**VICENZA** (the ancient *Vientia*), a city of Italy, capital of the province of the same name, is situated in a fertile country on the Bacchiglione, 40 miles west from Venice by railway through Padua, and had 39,431 inhabitants in 1882. It is inclosed by dry moats, which are partly cultivated, and by dilapidated walls, about 3 miles in circumference; and is very rich in palaces, many of them the finest works of Palladio; but the general appearance does not correspond with the elegance of these mansions. The cathedral and churches of Vicenza abound in paintings by native artists. The public buildings also comprise a carpenter, a theatre, basilica, episcopal palace, a triumphal arch leading to the Campo Marze, an orphan asylum, and several hospitals. Vicenza gives title to a bishop; it has a lyceum, two gymnasia, an ecclesiastical seminary, a college for boarders, and a public library with 56,000 volumes and about 200 MSS. There are also several private collections of minerals and fossils, with which the country abounds. The remains of antiquity consist of the ruins of a Roman theatre, some portions of a palace, and three arches of an aqueduct near the village of Ombra. Vicenza has long been known for its important silk manufactures. Woollen and linen fabrics, hosiery, lace, paper, porcelain, earthenware, leather, whalebone, and gold and silver articles are also made here. The industrial and wide trade in wooden wares, corn, and other agricultural produce.

Near the city is the *Monte Berico*, which is joined to it by a grand line of arcades, with 180 arches. Outside the town are the public cemeteries, and the *Porta del Castello*, a remarkably tower.

Vicenza was founded about a century before the Christian

era; and became a Roman municipal town. After being pillaged successively by Alaric, Attila, the Lombards, and the Emperor Frederick II., it came into the possession of the Venetians early in the fifteenth century; and they held it till the downfall of their republic in 1796. From that time to 1815 it formed a part of the French kingdom of Italy, and was united to Austria in the latter year. It was cruelly bombarded by the Austrian troops, 10th June, 1848. By the cession of Venetia in 1866, it was incorporated with the kingdom of Italy.

**VICEROY** (Fr. *vice-roi*, in place of the king), a title given to a person delegated as the governor of a large and important dependency of a kingdom, such as Naples, Spain, and Peru, under the old Spanish monarchy. In ordinary conversation and writing the lord lieutenant of Ireland is often called viceroy, but he is never so recognized officially. Since 1858 the title of viceroy has been taken by the successive governors-general of India.

**VICHY**, a town of France, in the department of Allier, situated 35 miles south of Moulins by rail, on the right bank of the Allier, famous for its hot springs, which were known to the Romans, and have made the town the most frequented watering-place of France. The ordinary population is about 10,000, but during the season there are about 20,000 visitors. The Allier is crossed by a suspension bridge. There are military and civil hospitals, and a large thermal establishment. The various springs range between a temperature of 60° and 113° Fahr.; they are clear and bubbling, like soda-water, bicarbonate of soda being the base; and as they also contain iron, they are excellent in all cases of debility of the stomach and bowels, bad circulation, gout, &c. Grande Grille is especially recommended for liver complaints; l'Hôpital and Source des Dames, for nervous affections and hysteria; the Celestins, for gravel and diabetes, and for scrofula.

**VICKSBURG**, the largest city in the state of Mississippi, U.S., on the Mississippi River, 350 miles above New Orleans, and 36 miles west of Jackson. Vicksburg was the scene of a long and memorable siege—and ultimate capture—by the Northern army, on 4th July, 1863. It presents a very striking and attractive aspect, as seen from the river. It was founded in 1836 by a planter. Near to the town is a large national cemetery, called the Valley of Death. More than 16,000 soldiers who fell in the siege and battles round the town during the Civil War lie buried here. It has several fine buildings, the most important of which are the court-house and the city hall. The population in 1880 was 11,814.

**VICO, GIOVANNI BATTISTA**, the founder of the philosophy of history and one of the profoundest thinkers and writers of modern times, was the son of a bookseller, and was born at Naples in 1668. He was brought up to no special profession, although he early evinced a peculiar aptitude for jurisprudence. But he was an insatiable reader, and an earnest and laborious student, particularly of ancient literature. In 1697 he became professor of rhetoric in the University of Naples, on a scanty salary; yet neither domestic cares and troubles (of which he had much more than the average share), nor professional disappointments, could subdue his ardour or cloud his intellect. His great work, the "*Principi di una Scienza Nuova*," on which he had been for many years engaged, was published at Naples in 1725. Several other editions followed during the author's lifetime; but his temporal advancement was not commensurate with the popularity his work achieved. Intense study and domestic cares broke him down at last, and he died on the 20th January, 1744. The fate of Vico's book was somewhat singular. After his death it appears to have fallen into oblivion, from which it was rescued only at a comparatively recent period. Michelet, for example, first made it known in England by the able exposition of its doctrines in his "*Principes de la Philosophie de l'His-*

toire," published at Paris in 1827. This work attracted the notice of English thinkers, and Vico's treatise was at once recognized as a production of genius. The "Scienza Nuova" is a deep and pregnant philosophy of history; a science of human nature generalized from the facts of human history, and indicating those universal moral characteristics which mark the social and political revolutions of nations under widely different circumstances of climate, government, religion, and manners. A complete edition of Vico was published in Milan in 1834 in six vols. John Stuart Mill has given distinction to Vico's philosophy of history in his "Logic."

**VICTOR** was the name of three popes.

**VICTOR I.** (Saint), was Bishop of Rome at the close of the second century and beginning of the third. Very few particulars of his life are known. His episcopate continued from 191 till 203. During the controversy between the Christians of Asia Minor and others respecting the celebration of Easter he wrote an imperious letter (now lost) to the Asiatic bishops, admonishing them to follow the example of others as to the time of observing Easter. Victor's intemperate zeal was condemned by Irenæus and others.

**VICTOR II.** a Swabian by birth, was Bishop of Eichstadt when chosen to succeed Leo IX. in 1055. His name was Gerhard. Henry III. of Germany, whose friend and adviser he was, was very reluctant to part with him, nor was Victor glad at his elevation. He was, however, received at Rome with great joy. He distinguished himself by his zeal against the prevailing corruption and immorality, as well as by his efforts to suppress errors in doctrine. He died at Florence, on his way back to Rome, in 1057, after a reign of two and a half years, leaving behind him the reputation of a pious and upright man.

**VICTOR III.** (*Desiderius*) was born at Benevento in 1029, became abbot of the monastery of St. Casino, and succeeded Gregory VII. as pope in 1086. He was most reluctant to leave the solitude of his convent, and had at last to be brought to Rome by the princes of Capua and Salerno, under the escort of soldiers, whose arms put him in possession of the greater part of the city. But his opponent, the antipope Clement III., and the party of Henry IV. in Rome, did not allow him to stay long there. In a few days he was obliged to leave. At Terracina he very gladly laid down all the insignia of office, and returned to his monastery, where he spent a year without molestation. He consented, however, to return to St. Peter's; the antipope was expelled, and Victor III. was solemnly consecrated in that sacred edifice. A few days after he profited by the tumult aroused by the emperor to consider himself forced to leave Rome and return to Casino. The Saracens then threatened the papal territory. Victor collected against them an army out of all the Italian states, and sent it forth against the foes, who were defeated in Africa. He also summoned a council at Benevento, at which Gilbert the antipope (Clement III.) was excommunicated and deprived of his archbishopric. Before the end of the council he sickened, and was taken to Casino, where he died 16th September, 1087, after presiding over the church a year and a quarter. It is said that he was poisoned. Urban II. succeeded.

**VICTOR IV.** (*Othavianus*), Antipope, became a cardinal in 1138, and was chosen pope by the imperial party after Hadrian IV.'s death, in opposition to Alexander III., whom the Sicilian party appointed in 1159. The Emperor Frederick I. (Barbarossa) called a council at Pavia, and invited both popes to it. Victor, who appeared, was solemnly recognized as the proper vicar of St. Peter, and continued to maintain his ground against his rival till he died at Lucca in 1164.

**VICTOR AMADEUS II.** the last Duke of Savoy and first King of Sardinia, was born in 1666, and had

a remarkably chequered career. He succeeded to the dukedom at the age of nine in 1675, his mother being regent. Summoned by Louis XIV. to join his forces to the French army, he allied himself with the confederates of Augsburg, and declared war against France (1690). His people applauded, but Catinat, the French general, defeated him, and stripped him of Saluces, Susa, and later on of Nice, Carnagnole, and Montmelian, invading the whole of Savoy (1693). To compensate him for his losses the emperor named him generalissimo of his armies. In 1696 he signed a treaty of peace, whereby his possessions were restored, but he was compelled to serve in the French army against Milan. In 1701 he gave his daughter in marriage to Philip, the new king of Spain, grandson of Louis XIV.; but notwithstanding this alliance it was not long before war recommenced with France. During the three campaigns 1703-05 he lost all his possessions save Turin, which was besieged by the French. Succoured by the famous Prince Eugène, who arrived with the imperial army, the French were utterly defeated, and Victor regained all his lost territory (1706). By the Peace of Utrecht he gained the island of Sicily, abandoned by Philip; and then for the first time the Duke of Savoy assumed the title of King of Sicily. Victor gave up the island of Sicily by the treaty of London, and received the island of Sardinia in exchange, with the title of King of Sardinia (1720). Victor Amadeus reformed the internal administration of his states, published a code of laws, and disgraced the Jesuits. In 1730 he abdicated in favour of his son Charles Emmanuel III., retiring with his second wife, the famous Countess of Saint Sebastian, to the Castle of Savoy. This ambitious creature incited him to reclaim the reins of power; his son arrested him, and he died at Moncalieri in 1732. The incident is the foundation of the superb play or dramatic poem by Robert Browning, under the title of "King Victor and King Charles."

**VICTOR EMMANUEL I.** King of Sardinia, was born at Turin in 1759, and succeeded his brother, Charles Emmanuel IV. (grandson of Charles Emmanuel III., see preceding article), on his abdication in 1802. The treaty of Paris restored him to his kingdom in 1814, and the treaty of Vienna gave him Genoa in 1815; but a revolution forced him to abdicate in 1821, in favour of his brother, Charles Felix. He died at Moncalieri in 1824.

**VICTOR EMMANUEL II.** King of Italy, was born 14th March, 1820, and was the son of Charles Albert, king of Sardinia (who succeeded Charles Felix on his abdication in 1831, see preceding article), and of Theresa, daughter of the Grand Duke of Tuscany. His father abdicated on the fatal day of Novara, 23rd March, 1849 (being the fourth consecutive sovereign of Sardinia who abdicated), and Victor Emmanuel succeeded to a heritage of defeat and disaster. The new monarch, however, soon gave unmistakable proof of honesty of purpose, an ardent love of Italy, and of a fixed purpose to secure her independence; and by such qualities he gained a firm place in the hearts of his subjects. He was fortunate in finding in Count Cavour a statesman filled with the same patriotic ideas as himself, and at the same time gifted with the capacity, the penetration, the daring, and the calculating patience necessary to carry them out. The king heartily agreed with Cavour that if Sardinia was to become the leader of Italy she must distance her in all the paths of progress. Accordingly, domestic reforms were undertaken; commercial treaties on free trade principles concluded with England, France, and Belgium; foreign commerce was encouraged; the Sardinian navy reconstituted, the army reorganized, and Sardinia gradually prepared for the better days in store for her.

The Crimean War broke out, and with a sharp view to the opportunities it afforded, Victor Emmanuel entered into the famous alliance with France and England against Russia. The Sardinian troops, at the battle of the Tcher-

naya, and on other occasions, brilliantly distinguished themselves and covered the Italian name with honour. Cavour was not slow to improve the opportunity he had now gained. At the Congress of Paris, sitting as representative of one of the belligerent powers, he was able to lay the state of Italy before the plenipotentiaries, to point out the necessity to her of freer rule, and to indicate the dangers which would result from an extension of Austrian domination.

Victor Emmanuel soon afterwards visited Paris and London, being the guest, in the former city, of Napoleon III. Count Cavour also had an interview with the French emperor at Plombières, and in January, 1859, Prince Napoleon was married to the Princess Clotilde, Victor Emmanuel's daughter. In the same year Napoleon III. entered upon his celebrated "war for an idea." In the month of July the battles of Magenta and Solferino were fought, the peace of Villafranca was signed, and Austrian power in the Peninsula received a fatal blow. Italians, however, were bitterly disappointed with the comparatively small results of a war which they hoped to have set Italy free from the Alps to the Adriatic; and the cession of Savoy and Nice increased the bitterness felt towards France. Meanwhile, events hurried along of themselves, and soon got beyond the control of France. Tuscany, Parma, Modena, and the Romagna revolted, threw off their dual yoke, and welcomed the Sardinian constitution; Garibaldi drove out the Bourbons from Sicily, and handed over the Neapolitan kingdom to Victor Emmanuel, who, on the 26th February, 1861, was proclaimed King of Italy.

With the war between Austria and Prussia, in 1866, came Italy's second opportunity, and it found her king and Parliament as ready as before to turn it to account. Unfortunately, with her arms on land and her navy on the sea, Italy nevertheless assisted Prussia by the diversion she effected at the close of the war was rewarded by the cession of Venetia. Victor Emmanuel was now master of all the Peninsula except the small portion on which papal power was still established. In 1862 Garibaldi's attempt to overthrow the papal power had led to Aspromonte. In November, 1867, a second attempt led to Mentana and the extension of French protection to Rome. Italy, however, had not long to wait. While the papacy seemed more powerful and more self-confident than ever, and while a great General Council sat in the Eternal City and served to impress ranking with the supremacy of papal power, the French Empire suddenly collapsed after a series of swift disasters, and the French troops were withdrawn. With hardly a blow the ardent desire of all Italy fell into the lap of Victor Emmanuel, who, on the last day of 1870, entered Rome in state and took possession of his new capital.

Victor Emmanuel bore his new honours as modestly as those he had previously gained. He was every inch a soldier, and had from his earliest years seen active service in the field. He may not have been a great king, but he was a honest one. His subjects affectionately nicknamed him "the honourable king" (*il re galantuomo*), because of his admirable straightforwardness. He was always faithful to constitutional principles, and shrank from no risk or pain when the interests of Italy were concerned; and his frank, mental bearing made him a favourite with his subjects. He died 9th January, 1878, and was buried in the Pantheon at Rome.

**VICTOR, SEXTUS AURELIUS**, a late-Roman historian, was reared under Constantius and his successors. He rose to eminence by his literary talents. The Emperor Julian appointed him governor of Pannonia, and Theodosius præfect of the city, while Valentinian showed his esteem by sharing the consulship with him, A.D. 373. His works are not all equally recognized as genuine. For instance, his "Origines of the Roman People" is usually held to be,

at all events as we know it, a later work. The next work is on "Illustrious Romans," from Romulus to Caesar. The third work is undoubtedly Aurelius Victor's: it is on the Cæsars, from Augustus to Constantius. (There is a continuation to Honorius, which, of course, is by a later hand.) The best edition is by Arnzen (Amsterdam, 1733).

**VICTORIA** (ALEXANDRINA VICTORIA), Queen of the United Kingdom of Great Britain and Ireland, with all its dependencies, and Empress of India, was born at Kensington Palace, 24th May, 1819. She is the sixth sovereign of the house of Hanover, and is the only child of Edward, Duke of Kent, fourth son of George III., and the Princess Victoria Maria Louise of Saxe-Coburg-Saalfeld, widow of Henry Charles, hereditary Prince of Leiningen, and sister to Leopold, late king of the Belgians. Her father died 23rd January, 1820, leaving his widow sole guardian to their only child. Neither George IV. nor his brothers, the dukes of York and Clarence, had surviving legitimate issue, and the Princess Victoria became heir-presumptive to the throne on the accession of her uncle, William IV., in 1830. She was very carefully educated by her mother, with whom was associated the Duchess of Northumberland, her preceptors from her fifth year being Dr. Davys, afterwards Bishop of Peterborough, and the Baroness Lehzen, a cultivated and devoted lady, whom the Princess Victoria described in after years as "My dearest, kindest friend." The fact that she was heir-presumptive to the throne was kept from her until she reached her thirteenth year, and, as she has since recorded, she cried much on learning it, remarking to the Baroness Lehzen, "Now many a child would boast, but they don't know the difficulty. There is much splendour, but there is more responsibility." After the accession of William IV. a Regency Bill was passed through Parliament, appointing the Duchess of Kent regent in the event of the king's death, and until her daughter should attain her majority, an additional sum of £10,000 a year to the £6000 which had been voted previously, being likewise granted for the maintenance and education of the princess. She now began to attend all the great state ceremonies, and under her mother's care she made numerous educational tours throughout England and Wales. On one of these she performed her first public act in presenting a set of colours to the 89th Regiment at Plymouth. In 1836, her uncle, the Duke of Saxe-Coburg, accompanied by his two sons, the Princes Ernest and Albert, paid a visit to England, and she now saw her future husband for the first time. On 20th June, 1837, William IV. died at Windsor Castle at twelve minutes past two in the morning, and at five o'clock the Primate (Dr. Howley), the Lord Chamberlain (the Marquis of Conyngham), the Master of the Horse (the Earl of Albemarle), and Sir Henry Halliday, the late king's physician, waited upon the princess to inform her that she was Queen. Summonses to the Privy Council were hastily issued by the Prime Minister (Lord Melbourne), and at eleven o'clock the young queen took the oath to govern the realm according to law, and made her royal declaration. With becoming self-possession, tinged by a graceful modesty, she read her speech in a clear, distinct, and audible voice, her tone and manner producing on the distinguished assembly an effect that was of happy augury for the future. The formal proclamation of the Princess Victoria as queen was made in the courtyard of St. James' Palace, 21st June, and she gratified a natural feeling of her subjects by appearing at a window overlooking the courtyard to acknowledge their plaudits. Standing between Lords Melbourne and Lansdowne, she returned the repeated cheers for a time with much ease and dignity, but it was observed during the close of the proceedings that she was moved to tears, a circumstance commemorated in a graceful poem by Mrs. Browning. On 17th July the queen attended the dissolution of Parliament and read her speech on that occasion, and on 20th November she opened the new Parlia-

ment, making the usual declaration against the Pope and Roman Catholicism. By her accession the crowns of England and Hanover, which had been worn by the same person since 1714, were separated owing to the Salic Law, the kingdom of Hanover falling to the Duke of Cumberland. In this way the revenues of Hanover also ceased to come to the British sovereign, and Parliament having taken the matter into consideration, voted a yearly sum of £385,000 for the support of the queen and her household. Her coronation took place at Westminster Abbey on 28th June, 1838, amid circumstances of great pomp and splendour. The rejoicings on this occasion lasted over several days, and the people, as Lord Brougham observed, "taking counsel with hope, rather than experience," displayed such an outburst of loyalty as had never been witnessed within living memory. The queen received her first instruction in her political duties from Lord Melbourne, the Whig prime minister, and it is universally admitted that in him she found a most admirable adviser. Considerate, deferential, and yet almost fatherly in his kindness, he enjoyed from the first the fullest confidence of the queen, and it was with great regret that she heard of his defeat in 1838 in the House of Commons. By the advice of the Duke of Wellington she sent for Sir Robert Peel, who undertook to form a ministry, but when he asked for the dismissal of certain of the ladies of the bedchamber, who were closely connected with the leading Whigs, her Majesty declined his services and Lord Melbourne returned to office, which he retained until August, 1841. In 1839 the queen was betrothed to Prince Albert of Saxe-Coburg-Gotha, and the fact was made known to Parliament on 16th January, 1840. The House of Commons subsequently voted an allowance of £30,000 per annum to Prince Albert, and the queen conferred upon him the title of Royal Highness, and appointed him a field-marshal of the British army. The marriage took place at St. James's Palace, 10th February, 1840, amid general rejoicings throughout the nation. The queen's choice was most amply justified by the manifold accomplishments and benevolent disposition of the prince, whose character and career we have noticed elsewhere (see ALBERT, PRINCE), and the union was one of deep and pure affection from first to last.

The first offspring of the union was the Princess Victoria, who was born 21st November, 1840. In 1841 the Whig ministry gave place to the Conservatives under Sir Robert Peel, who retained office until 1846. On 9th November, 1841, the Prince of Wales was born, an event which the queen referred to at the opening of her next Parliament as completing her domestic happiness, and which was hailed with acclamation throughout the country. At the close of 1842 the queen and prince paid their first visit to Scotland, being everywhere received with enthusiastic loyalty, and thoroughly enjoying the visit. On 25th April, 1843, another babe was born to the royal couple in Princess Alice, a child destined to be a great comfort to her mother in her later days of trial and sorrow. In the same year the queen and her husband paid a visit to France, where they were entertained by the King of the French, Louis Philippe, and his queen, Marie Amélie. A visit to her Majesty's uncle, King Leopold, followed, and in 1844 the Emperor Nicholas, Czar of all the Russias, visited the queen and her husband at Windsor Castle. The 6th of August, 1844, was marked by the birth of Prince Alfred, and in the September of that year the Queen and Prince Albert, with their eldest child, paid a second visit to Scotland. On returning to Windsor they received a visit from Louis Philippe, and on 1st January, 1845, the queen opened the new Royal Exchange in the city of London, the front of which bears the inscription, suggested by Prince Albert, "The earth is the Lord's, and the fullness thereof." After the prorogation of Parliament in June, 1845, she paid, with the prince, her first visit to Germany, and during this

journey she occupied, for a short time, the room in the Palace of Rosenau where the prince had been born. The year 1846 was marked by the birth of the Princess Helena on 25th May, and the retirement of Sir Robert Peel in June, in favour of Lord John Russell, and the year 1847 by the installation of the Prince Consort as Chancellor of Cambridge University. The year 1848 was one of revolution, among the exiles who sought refuge in England being Louis Philippe, the dethroned king of the French, and his family; and the work of the queen may be imagined when it is stated that, during this fateful year, no fewer than 28,000 despatches were received or sent out from the foreign office, all of which came under her cognizance.

The year 1848 saw also another addition to the royal household in the birth of the Princess Louise, which took place on 18th March, and in the September of that year the queen made her first stay at Balmoral, the home which was destined afterwards to become her favourite residence. In the August of 1849 the Queen and Prince Albert, with four of their children, visited Ireland, where they were received with a welcome which has never been transcended in enthusiasm, either in England or Scotland. Before leaving the country her Majesty created the Prince of Wales Earl of Dublin, as a tribute to the Irish nation. On 1st May, 1850, the queen's third son was born, and he was named Arthur, after her Majesty's honoured friend and illustrious subject the Duke of Wellington.

Several deaths of note, all affecting her Majesty and the prince, occurred this year, including those of Sir Robert Peel, the Duke of Cambridge, Louis Philippe, and the Queen of the Belgians. On 1st May, 1851, the fruition of one of the dearest projects of the Prince Consort was realized in the opening of the great exhibition in Hyde Park by her Majesty. The scene was grand and unique, and writing afterwards concerning it, the queen said, "It was one that can never be effaced from my memory, and never will be from that of any one who witnessed it. Albert's name is immortalized." The exhibition was a great international success, and reflected the utmost credit upon its originator, the Prince Consort. In the autumn of that year the queen and prince visited Liverpool and Manchester, making royal progresses through those towns, and being everywhere received with enthusiasm. In 1852 the queen received a legacy of £250,000, which had been bequeathed her by an eccentric barrister named John Camden Nield, but the year was saddened towards its close by the death of a tried and valued friend, in the Duke of Wellington. On 7th April, 1853, Prince Leopold, the youngest of the queen's sons, was born, and in the following year her Majesty and Prince Albert paid a second visit to Ireland for the purpose of opening the Dublin Exhibition. The two years which followed were years of pain and anxiety to the queen, for they mark the period of the Crimean War, the opening of this ill-managed campaign being made the more distressing owing to certain malevolent attacks upon the Prince Consort, charging him with a want of sympathy with his adopted country. These charges were warmly resented by the queen, and their baseless character was exposed by Lord Aberdeen and Lord John Russell in the Houses of Parliament. The gross incompetency displayed by the military authorities in the management of the commissariat, and the terrible sufferings entailed upon the soldiers in consequence, aroused the just indignation of the nation, and the letters of the queen written at this time showed that she fully shared in this sentiment. The death of the Emperor Nicholas took place 2nd March, 1855, and the following month was marked by a visit of Louis Napoleon, the emperor of the French, and the Empress Eugénie, who were cordially welcomed by the queen and Prince Consort at Windsor.

The treaty of Paris, which closed the war, was signed 30th March, 1856, and in the July of that year the queen

reviewed at Aldershot the troops returned from the Crimea. In the November of that year the queen lost her half-brother, the Prince of Leiningen, and the blow was a heavy one, for much affection had subsisted between them, but on 14th April, 1857, a new life came with its consolation, in the birth of the Princess Beatrice, her Majesty's fifth daughter and last child. The autumn of the year was marked by the outbreak of the terrible Indian Mutiny, and when it was finally suppressed the East India Company was abolished by Act of Parliament, and the government of India was transferred directly to the British crown. In January, 1858, the first break in the queen's own family occurred when the Princess Royal became the wife of Prince Frederick William of Prussia, and in the August of that year the queen and prince visited the Emperor of the French on the inauguration of Cherbourg, afterwards proceeding to Germany to visit their newly married daughter in her own home at Babelsburg. In 1860 her Majesty held two great Volunteer reviews, one in Hyde Park, and one in Queen's Park, Edinburgh, and she also opened the National Rifle Association at Wimbledon, and instituted the queen's annual prize of £200. In the following March the queen sustained a heavy loss in the death of her mother, the Duchess of Kent, but heavy as was the blow, it was to be followed by one yet more crushing, in the death of her beloved husband, the Prince Consort, which took place 15th December, 1861. On the preceding February, when the royal pair celebrated the twenty-first anniversary of their wedding day, the queen had written to King Leopold, "Very few can say with me that their husband, at the end of twenty-one years, is not only full of the friendship, kindness, and affection which a truly happy marriage brings with it, but of the same tender love as in the very first days of marriage," and during the last hours of the prince it was observed that when the queen was by his side all the irritability and restlessness characteristic of the disease vanished, while he murmured in the tongue of his childhood loving words of endearment to his wife.

Long before his death the prince, by his genuine goodness and high abilities, had earned the respect and confidence of the nation, and throughout the empire there was a spontaneous and universal feeling of sympathy with the queen in her unspeakable sorrow. For some years after this event the queen felt compelled to remain in strict retirement, although she never neglected her necessary duties of state, nor has it ever been possible for her to resume fully the mode of life pursued during the earlier and happier years of her reign. In July, 1862, she was called upon to bid farewell to Princess Alice, a lady who, in her unselfish consideration for others and high intellectual qualities, greatly resembled her illustrious father, and who had been a great solace to her royal mother in her widowhood, but was now called upon to go with her husband, Prince Louis of Hesse, to her own home at Darmstadt. In March, 1863, the marriage of the Prince of Wales with Princess Alexandra of Denmark took place, and the hearty and enthusiastic welcome afforded the princess happily proved to be but the prelude to that sincere respect and affection with which she has ever since been regarded by the nation. In 1865 the queen lost an able and a popular minister in Lord Palmerston, who died 18th October; and endured a still heavier loss on the 9th December following, in the death of her uncle, King Leopold, who had been her affectionate friend and adviser from the moment she ascended the throne. The chief events of the year 1866 in the public life of the queen were the opening of the first session of her seventh Parliament in person, on 6th February; the institution of the Albert medal for the saving of life at sea; the presentation of her portrait, beautifully painted in enamel, on a plate of gold, to the American philanthropist, George Peabody, to mark her sense of his munificent gifts intended to benefit the poor of

London, and the marriage on 5th July of her daughter, Princess Helena, to Prince Christian of Schleswig-Holstein.

The year 1867 was marked by visits from the Queen of Prussia, the Sultan of Turkey, and the Empress of the French, and during the year following the queen laid the foundation-stone of St. Thomas Hospital, and paid a short visit incognito to Switzerland. In 1869 the outbreak of the Franco-German War involved the imperial family of France in ruin, and before it ended the queen visited the ex-Empress Eugenie at Chislehurst, to sympathize with her in the sudden and overwhelming disasters which had fallen upon the emperor and herself. On 21st March, 1871, the Princess Louise was married to the Marquis of Lorne, the ceremony taking place in St. George's Chapel, Windsor Castle. In the ensuing December the queen hastened to Sandringham in consequence of the alarming illness of the Prince of Wales. The disease was typhoid fever, and for a time the life of the patient hung in the balance, but happily it terminated in complete recovery, an event recognized by the holding of a thanksgiving service, 27th February, 1872, at St. Paul's Cathedral. On 23rd January, 1874, the Duke of Edinburgh was married at St. Petersburg to the Grand-duchess Marie of Russia, and in the April of that year the queen inspected the regiments returned from Ashanter, and personally conferred the medal awarded. In the August of 1875 her Majesty received a painful mental and nervous shock from an unhappy accident at sea, of which she was the involuntary witness. Crossing from the Isle of Wight to Southampton, the royal yacht *Alberta* ran into and sank the yacht *Mistletoe*, belonging to Mr. Heywood of Manchester. Most of the crew of the latter were rescued, but the master of the yacht and a lady, the sister-in-law of the owner, were drowned. The queen, who was much distressed at the accident, personally assisted in the restoration of those who were rescued. Later in the year the Prince of Wales made a lengthened tour through her Majesty's Indian dominions, and shortly afterwards Lord Beaconsfield carried the Royal Titles Bill through Parliament—one result of the latter being that the queen was proclaimed Empress of India in April, 1876. The year 1878 brought a heavy sorrow upon the queen, in the death of her daughter, Princess Alice, who succumbed to a severe attack of diphtheria, caught from her children, whom she had tenderly nursed for several weeks previously. Other deaths which greatly affected the queen were those of the Prince Imperial of France, whose zeal for active service had led him to volunteer his services in connection with the war in Zululand, and of the Earl of Beaconsfield, who died full of years and honours, 19th April, 1881. Another marriage occurred in the royal family in March, 1879, when the Duke of Connaught espoused the Princess Louise of Prussia, the wedding being celebrated at St. George's Chapel, Windsor, and the same place was the occasion of another royal wedding in April, 1882, when the Duke of Albany was united with the Princess Helen of Waldeck. During 1882 the queen proceeded in state to dedicate Epping Forest for the enjoyment of the people, and to open the New Law Courts in the Strand. On 28th March, 1883, the queen was called upon to endure another heavy trial in the sudden death of her youngest son, the Duke of Albany, who expired in a fit of apoplexy at Cannes, where he had been staying for the benefit of his health. The duke, in the qualities of both mind and heart, resembled more closely than either of his brothers, their august father, and his few public utterances had already gained for him the respectful admiration of the more thoughtful in the nation.

The notable event of the year 1885 was the marriage of Princess Beatrice, the youngest daughter of her Majesty and for many years her inseparable companion, to Prince Henry of Battenberg. The wedding was solemnized in the little church of Whippingham, in the Isle of Wight, and in



deference to the very natural wish of the queen, it was arranged that the royal couple should reside with her Majesty, so that she might not be deprived of her daughter's society. During 1886 her Majesty appeared several times in public, the more notable occasions being in connection with the laying of the foundation stone of the new Medical Hall on the Victoria Embankment, the opening of the Indian and Colonial Exhibition at South Kensington, the International Exhibition at Liverpool, and the Royal Holloway College for Women at Egham. In the year 1887 also, her Majesty made a state visit to Birmingham to lay the foundation stone of the Victoria Law Courts, and another to the East-end of London to open the celebrated People's Palace at Mile-end. This year being the fiftieth year of her Majesty's reign, was celebrated with jubilee rejoicings throughout the whole of her dominions, chief among which were the ceremonies observed in June, when the queen attended divine service at Westminster Abbey, and afterwards gave a series of royal entertainments at St. James's Palace.

From the day of her accession to the throne Queen Victoria has enjoyed to the fullest extent the respect and affection of her subjects, yet several attempts have been made to assassinate her by malicious or crazy individuals; one in June, 1810, by a discharged pot-boy named Oxford, who fired two pistols at her, and was afterwards found to be insane; another in May, 1842, by a man named John Francis, who was punished by transportation; a third in the July of the same year by a chemist's assistant named Bean, whose only punishment was eighteen months' imprisonment; and yet another by a man named MacLaren, who fired at her as she was entering her carriage, 2nd March, 1882, and who on investigation was found to be insane. On each of these occasions the queen happily escaped without injury, but she was less fortunate in 1840, when only a few weeks before the birth of Prince Arthur, one Lieutenant Pate struck her on the head with a walking stick, and inflicted a severe wound on her forehead. On his trial he pleaded insanity, but the plea was not accepted, and he was sentenced to a term of transportation.

In reference to the public events of her Majesty's reign, the first years after her accession were disturbed by the rebellion in Canada, the agitation against the Corn Laws, the Chartist agitation, Irish affairs, the Afghan War, with its terrible disaster to the British army in its march from Cabul, and the war with China. The government, under the direction of Sir Robert Peel (1811-46), succeeded in placing foreign affairs on a satisfactory footing, and carried through the institution of an income-tax and the abolition of the Corn Laws. The ministry of Lord John Russell (1846-52) carried the empire safely through the Irish famine and the dangers of the year of revolution (1848), and repealed the Navigation Laws (1849). The Conservatives held office through 1852, and were succeeded by the Aberdeen Coalition Ministry, under whose feeble direction the country drifted into the Russian War of 1854-56. Forced to give way before the pressure of public opinion on the question of the Russian War, they were followed by the Palmerston ministry (1855-58), who brought to a close the conflict with Russia, as well as the wars which succeeded with Persia and China. They directed also the first steps taken for the suppression of the Indian Mutiny of 1857-58, but were defeated February, 1858, and were succeeded by the ministry under Lord Derby, which held office till June, 1859, when Lord Palmerston was reinstated. The rebellion in India having been suppressed, the possessions of the East India Company were transferred to the crown in August, 1858. The friendly relations which existed from the first with Napoleon III. were maintained throughout his reign, and the country preserved its neutrality during the Italian War of 1859, the Civil War in the United

States of America (1862-65), the Polish insurrection of 1863-64, and the war in Schleswig-Holstein (1864-65), though decided leanings on the part of the Palmerston ministry more than once threatened serious complications. The expedition against Mexico in 1861 was soon abandoned, and the protectorate over the Ionian Islands was given up in 1863. Lord Palmerston died in October, 1865, and the ministry, which had been remodelled under Earl Russell, was defeated over the Reform Bill in June, 1866. The ministry of Lord Derby, which succeeded, carried a Reform Bill through Parliament in 1867. Lord Derby resigned in February, 1868, and Mr. Disraeli became prime minister, and under his direction the Abyssinian expedition, which had been begun under Lord Derby, was brought to a successful conclusion. There being a majority against Mr. Disraeli in the elections of 1868, he resigned in December of that year, and was succeeded by Mr. Gladstone, who held office until 1874. The leading events of his administration were the disestablishment of the Irish Church, the passing of the Irish Land Act, of the Elementary Education Act, of the Ballot Act, the abolition of purchase of army commissions, the negotiation of the treaty of Washington, whereby the Alabama claims were settled by arbitration, and the Ashantee War. In 1874 Mr. Gladstone gave way to Mr. Disraeli, whose administration was signalized by the purchase of the Suez Canal shares belonging to the Khedive of Egypt, by means of which Great Britain gained a position of influence in the management of the Canal Company, and the acquisition of Cyprus. In 1880 Mr. Gladstone returned again to power, and in 1885 his ministry succeeded in passing through Parliament a Reform Bill, which added about 2,000,000 electors to the 3,000,000 previously existing, and a Redistribution Bill, which did much to equalize the representation of the nation. In June, 1885, the Gladstone ministry resigned, and a new ministry was formed under Lord Salisbury, but the latter resigned on 26th January, 1886, and Mr. Gladstone returned to office. His scheme for giving Home Rule to Ireland being rejected by Parliament, he resigned office again in 1886, and Lord Salisbury once more returned to power.

No period of British history has been marked by such wonderful progress in everything pertaining to the national well-being as that occupied by the reign of Queen Victoria, and among the many events deserving notice we may enumerate the abolition of slavery throughout the British dominions, the softening and improving of the criminal code, the thorough reorganization of the system of poor laws, the institution of free trade, the passing of numerous measures for the protection of workmen, women, and children, the removal of invidious religious distinctions, the opening of the universities, the admission of the majority of the capable subjects of the nation to a share in its government, and the placing of education within the reach of all. During this period vast additions have been made to the extent of the British Empire, and it is computed that at the present day the name of the queen is honoured by 320,000,000 subjects, extended over 9,000,000 square miles of the earth's surface.

Of all these great changes the queen has been an intelligent and interested observer, and she has never failed to consider the interests and the welfare of her subjects whenever and wherever possible. In all matters pertaining to the government of her vast empire she has ever been a model constitutional sovereign, and though of necessity she has at times held opinions different to those of her ministers in respect to legislation, she has ever deferred to the wish of the nation as expressed in the action of Parliament. For genius of every kind she has always felt a warm admiration, and throughout the whole of her life she has made herself familiar with all that is best in music, art, and literature. Kind and affectionate in her domestic

relations, her sympathy has not been limited to her own family circle, but to all those admitted to her friendship, and to her dependants she has ever displayed a spirit of tender consideration. In all public sorrows the queen has had a share, and often she has taken the lead in measures of practical benevolence and helpfulness, while a large number of private persons at home and abroad cherish among their dearest treasures the letters of tender sympathy they have received from her Majesty in hours of bereavement and sorrow. Admirable in all her relations as sovereign, wife, mother, and friend, she enjoys perhaps a fuller measure of respect and loyalty than was ever enjoyed by British or English sovereign since the period of the Heptarchy, and we can but hope that the day may be far distant when the vast multitude of her subjects can no longer greet her as the Queen of the mighty British Empire.

For the personal life of the queen and her royal partner see "The Early Life of the Prince Consort," compiled under her Majesty's direction by General Grey (1867); "The Life of the Prince Consort," compiled under her Majesty's direction by Sir Theodore Martin (1875-79); and "Leaves from the Journal of our Life in the Highlands" (1869), in the preparation of which the queen was assisted by Sir Arthur Helps. Most of the great public events of her reign will be found noticed under their appropriate headings. See also Nassau Molesworth's "History of England from the year 1830" (three vols., London, 1871-73), Justin McCarthy's "History of our own Times from the Accession of Queen Victoria" (London, 1879), and "The Victorian Empire" (Mackenzie, London, 1887).

**VICTORIA**, a colony of Great Britain occupying the south-east corner of the Australian continent, lies between 34 and 39° S. lat., and 141° and 150° E. lon. It is bounded on the N.E. and N. by New South Wales, from which it is divided by a straight line from Cape Howe to the nearest source of the Murray River, and then by that river to the boundary of South Australia; W. by South Australia, from which it is divided by the meridian of 141° E. lon.; S. by Bass Strait, which separates it from Tasmania; and E. by the Pacific Ocean. The length from east to west is about 500 miles, and its mean breadth, measured on the meridian of 141° degrees, about 200 miles. The total area is 87,884 square miles.

**Coast.**—The coast, about 600 miles in length, is generally low and unbroken in the west, from the mouth of the Glenelg to Cape Otway, between which are situated the available harbours of Portland, Port Fairy, and Warrnambool; and in the east from the harbour of Port Albert, in lon. 147°, to Cape Howe, between which latter points almost the only features which tend to diversify its monotonous appearance are a series of lagoons, of which Lake King is the largest. From Wilson Promontory to Lake Otway the coast becomes skirted with perpendicular cliffs, rising from 500 to 1000 feet above the sea, and indented by numerous bays. Of these the most remarkable is Port Phillip, which, scarcely 2 miles wide at its entrance, forms a kind of inland sea, stretching from north to south for about 55 miles, and expanding from east to west, near its centre, to 50 miles, though its average width is only 18 miles. The total area is about 800 square miles. The harbour is one of the safest as well as the largest in the world. Separated from Port Phillip by a low promontory is the well-protected but shallow harbour of Western Port, also very protected by Phillip or Grant Island at its mouth, and divided into an east and a west arm by French Island near its centre. Still further east the most remarkable feature of the coast is Wilson Promontory, the southern extremity of the province and of the continent of Australia, connected with the mainland by a low sandy isthmus. It consists of a lofty mass of granite, with summits rising to the height of 5000 feet, and usually enveloped in mist. It

extends into the sea for a distance of nearly 20 miles, and is from 6 to 14 miles wide. On the north of this promontory is the last great indentation of the coast, Corner Basin, protected south and east by several low sandy islands, of which the largest is La Trobe. The centre seaboard faces the south and east, and has an extent of about 700 miles.

**Surface.**—The interior is finely diversified, both by mountains and plains, but is chiefly characterized by the latter, which are often of great extent, and so sparingly wooded and free from other obstructions, that it has been said the plough could in some parts be drawn continuously for 100 miles across tracts well suited to agricultural purposes. A range of mountains traverses the entire length of the colony, dividing it into two unequal parts. This range runs in an eastern and western direction, generally at a distance of 60 or 70 miles from the sea-coast. It is part of the Australian Cordillera, and is called the Dividing Range; all the Victorian rivers have their sources in this range or in its spurs, those to the north running towards the Murray, and those to the south flowing into the sea. Its eastern part, which divides the Gipps Land district from the Murray, is known as the Australian Alps. It varies in height from 1000 to 7000 feet, the principal peaks being Mount Smyth, Mount Selwyn, The Twins, Forest Hill, and the Cobberas. The range dividing the Wimmera district from the county of Ripon is termed the Pyrenæes; the principal peaks are the Coorong-Ageering, the Jambour, and Ben Nevis. The Grampians form the west termination of the Great Dividing Range; the principal peak is Mount William, 5600 feet high. Other mountains are—the Benambras, the Gibbo, Bogong, Buffalo, and Entler ranges; the Delatite, Mount Wellington, Bawbaw, Hoddle, Strzelecki, Dandenong, Victoria, and Sierra ranges. The ranges running at right angles to the main Dividing Range are not very lofty, and consist mostly of heavily-timbered hills, although in the Geelong and Ballarat districts are numerous bald hills, the slopes of some of which are in a high state of cultivation as vineyards and otherwise. In the south one of the most remarkable summits is Mount Abrupt, a few miles north-west of Mount Sturgeon. It is 1700 feet in perpendicular height, and contains a crater 446 feet in breadth and 80 feet in average depth.

**Geology.**—Victoria seems to be formed of a great mass of Palæozoic rock, through which protrude large areas of granite and trap, and upon which repose, near the coast, belts of Mesozoic and Tertiary strata, and volcanic products. The younger members of the Tertiary or Cainozoic series, and the older members of the primary or Palæozoic series, are by far the most widely distributed, and are in all respects the most prominent and important formations. With their associated granitic and plutonic or igneous and volcanic rocks they occupy nearly nine-tenths of the surface of the country. Devonian sandstone, slates and limestones occur in Gipps Land; secondary rocks are found in the Cape Otway district and the country east of Western Port. The extinct volcanoes are remarkable and apparently recent: there are several to be found on the south-western side of the dividing range. Many of the plains are formed by outflows of basalt.

**Rivers and Lakes.**—The absence of rivers of any size is one of the greatest obstacles to the opening up of the country. With the exception of the Murray, the Goulburn, the Yarra-Yarra, and the Gipps Land streams, none are navigable in the English acceptance of the term. The names of the principal rivers and their length are as follows:—The Murray, 1300 miles, 980 miles of which flow along the Victorian border; it rises in the Australian Alps near Forest Hill; Goulburn, 315 miles, a tributary of the Murray, having its source in the Great Dividing Range; the Snowy, 300 miles, 180 of which are in New



South Wales; Glenelg, 281 miles, rising in the Grampians; Wimmera, 228 miles, has its sources in the Pyrenees and Grampians; Loddon, 225 miles, rising in the Dividing Range; Mitta-Mitta, 175 miles, rising in the Australian Alps near Mount Omeo; Avoca, 163 miles, also rises in the Pyrenees on its eastern side; Hopkins, 155 miles, springs from the Pyrenees; Campaspe, 150 miles, rising in the Dividing Range and flowing into the Murray; Wannon, 150 miles; Yarra-Yarra, 150 miles, has its rise among the southern spurs of the Dividing Range; Ovens, 140 miles, rises in the Australian Alps; Latrobe, 135 miles, springing from Mount Baw Baw, and falling into Lake Wellington. In winter time the rivers are frequently swollen by the heavy rains into angry torrents, which carry all before them in their resistless course, and, overflowing their banks, devastate the country. Many of the smaller streams, colonially called "creeks," and, indeed, some of the larger rivers in the west, dwindle down into mere threads of water, and occasionally pools or water-holes, during the summer heat, and sometimes dry up altogether, a circumstance which, when it occurs, is productive of terrible loss to stockowners, cattle dying in thousands from thirst.

There are numerous salt and fresh-water lakes, many of these being dry during the summer months, and all of them more or less shallow; the largest of these is Lake Corangamite, covering 57,700 acres. This lake, with a number of small ones in its neighbourhood, has no visible outlet, and is extremely saline, from the accumulation of salt in solution passed into it by drainage from the basalt rock, the water being kept down by vaporization, while the quantity of salt continually increases.

*Climate and Productions.*—The mean annual temperature of the seasons in Victoria is—spring, 58.7°; summer, 67.1°; autumn, 59.4°; winter, 50.3°. This temperature more closely resembles that of Lisbon and its neighbourhood than of any other part of the continent of Europe. January and February are the warmest months, and June and July the coldest.

In autumn and winter the northerly winds exceed the southerly, and in spring and summer the reverse is the case. In summer the north wind from the interior is often dry and hot; but at night it generally changes to the south-west or south, and from either of these points it is always cool and refreshing. It has been remarked—"The climate is indeed delicious. Probably in no part of the world is it possible to find fewer impediments to labour or recreation, as regards the weather, than in Victoria. Though the summer is invariably marked by a few days of great heat, yet, even in that season, there are many days when the weather is pleasant and cool, and nothing can exceed the climate experienced in this colony during the autumn, winter, and spring. A cloudless sky, a bright sun, and a refreshing breeze are characteristic of the greater number of days in each of these seasons; and while the salubrity of the climate is shown by the absence of those diseases which yearly sweep off so many in England, it is yet equally favourable to the growth of the fruits and vegetables of colder countries. The river basins are mostly at right angles to the sea, so that the sea breezes penetrate far inland. The apple, pear, peach, nectarine, apricot, almond, gooseberry, currant, and fig; and the cabbage, cauliflower, turnip, carrot, parsnip, asparagus, pea, bean, water melon, rock-melon, and tomatoes may be seen all growing together luxuriantly in the same plot of ground; while the borders blossom with the fuchsias, geraniums, and other common flowers of the English garden."

The largest trees indigenous to the colony belong to the eucalyptus tribe—popularly known as the gum tree. This tree has been extensively exported, as it is believed to possess great efficacy in correcting the miasmatic influences of swampy land. The varieties known as the red and

blue gums are the most useful; as regards size, the species known as the peppermint (*Eucalyptus amygdalina*), though a middle-sized tree in open plains, attains a colossal height in the mountain ravines, and there are reasons for believing that the highest trees in the world are to be found in this colony, overtopping even the celebrated Mammoth trees (*Wellingtonia gigantea*) of the Yosemite Valley. In the Dandenong ranges, trees 420 feet in height have repeatedly been measured. Near Healesville a fallen tree measured 480 feet, being 14 feet higher than the spire of Strasburg Cathedral. The Casuarina or shea oak, the Banksia or honeysuckle, the native cherry-tree, a bushy, shrub-like tree, having the peculiarity of the stone growing outside the fruit, the Melaleuca (known as the ti-tree, flourishing in marshy districts), and several varieties of the acacia, of which the wattle is the most common, comprise the most widely distributed of the native trees. Ferns are numerous, particularly in the mountain gullies; the variety known as the great-nest fern has been found with fronds 6 feet in length. As a timber-producing country, Victoria has many advantages. The woods of nearly all the trees are durable, and many of them are beautiful, and admirably fitted for the finer kinds of cabinet work, especially blackwood, myrtle, and myall, which bear a very high polish.

The most valuable of all Australian woods is the *Eucalyptus rostrata*, or Red Gum. The timber is hard and dense, with a rather short but handsome and curly grain, and almost free from any tendency to shrink longitudinally. It is next to indestructible in damp ground or in water, salt or fresh, and although not adapted to stand horizontal strain from the shortness of the grain, it makes within reasonable length, the best of all piles for engineering works, in consequence of its resistance to the attacks of the *Teredo navalis*. It also makes splendid planking and sleepers for bridges and wharves, and, properly seasoned, knees and other rigid portions of ships' framing. Next in value is the Blue Gum (*Eucalyptus globulus*), and the Box (*Eucalyptus riminalis*). They are very strong, and are adapted for heavy longitudinal bearers, but not for piles, owing to being pervious to the teredo. Blue gum makes excellent "sawn stuff," and box is used for the naves of wheels and the cogs of machinery. Stringy-bark and peppermint are free splitting woods, and are used for shingles, palings, posts, and rails. Iron bark is a very heavy and hard wood, and is much used by wheelwrights and coachbuilders for wheel spokes. The blackwood and the nightwood varieties of the acacia are magnificent woods, largely used by coachbuilders, coopers, cabinet-makers, and in the construction of railway carriages and trucks, and the better class of agricultural implements. The wattle is used as staves for casks, and the bark for tanning purposes, the myall for whip handles and tobacco pipes. There are many other varieties of timber not so well known, but some of them are gradually coming into repute.

The land available for pastoral and agricultural purposes has been approximately classified thus:—Of rich light loam, generally distributed near the coast, there are approximately 36,000 square miles, generally to be met with on terraced flats along the river valleys, and running in narrow belts along the sea-coast; it is also found in extensive level plains with stunted timber and thickly-grassed undulating forest country. The geological features of these stretches are clay, sand, lime, gravel, tertiary, and superficial deposits, including alluvial. Of cold sandy clays and loams, occupying the central, north, north-east, and south-east portions of the country, there are about 28,000 square miles in hilly and undulating country, abounding in iron-bark and stringy-bark trees, growing on clay, slate, schist, and sandstone; of rich black and chocolate soils, eminently adapted for purposes of tillage, distributed in the south-western and central districts, there are about

12,000 square miles of volcanic origin; of light and sandy soil of granitic formation, in patches throughout the country, there are about 8000 square miles; of rich sandy loams, near Geelong, and in the counties of Normanby and Dundas, South Grenville and Polwarth, there are about 3000 square miles, showing shales and soft sandstone. Nearly everything grown in England flourishes in Victoria, and very many things that the cold, uncertain climate of England will not allow to attain to maturity thrive in the colony. Wheat, barley, and oats—the latter cultivated more as hay than for grain—are the farmers' leading articles. Next come potatoes, rye, pease, beans, maize, sorghum, mangold-wurzel and beet, clover and various fodder grasses, which are largely grown. Of tobacco, too, a large breadth has been devoted to its cultivation. Among other things which have been successfully tried are hemp, flax, hops, chicory, beet, canary grass; and in fruit all kinds flourish, as do also, in some localities, olives, oranges, guavas, black mulberries, and other fruits. The cereals do remarkably well. The greatest weight recorded of a bushel of wheat is 69 lbs. 4 oz., the average is about 61 lbs.; the average weight of oats is 40 lbs., of barley 51 lbs., and of maize 55 lbs. As many as 50 and 60 bushels of wheat, 60 bushels of oats, and 42 bushels of barley per acre have been obtained; but these returns are unusual. From the nature of the soils and the favourable character of the climate, wine and oil of good quality can be produced with ease in Victoria. Already the wines made in the colony have taken a high place in the estimation of European connoisseurs, and the cultivation of the grape will form a source of great wealth in time to come, if disease can be prevented or mastered and the culture systematically and intelligently carried on. Large vineyards have been planted, and while the quality of the wines is such as to command a ready sale at a high price, the yield is large, the average being about 250 gallons per acre. The culture of the vine has received a serious check through the ravages of the *Phylloxera castalis*.

The largest indigenous animal to be met with in Victoria is the kangaroo, known by the distinctive names of kangaroos, wallabies, and paddymelons; and kangaroo rats and mice, which are very plentifully distributed in various parts, and of which there are several species. Opossums are numerous, and so are the wombat, the porcupine, the bandicoot, the native bear, the native cat, and some others. There are also several species of the bat tribe, the largest of which is known as the flying fox, and causes great destruction among the fruit crops.

The feathered tribe is largely represented: there are several kinds of eagle and hawk; there are also the emu, crane, black swan, wild turkey, pigeon, duck, teal, waterhen, quail, snipe, plover, and many other birds. The parrot tribe is very numerous, and of the most brilliant plumage. Macropis and the great kingfisher, or laughing jackass, may, in the early morning or at sundown, be heard filling the "bush" with their peculiar noise.

Snakes are to be found in most parts of the colony; many of them are of a venomous nature, the black and brown snake and the deaf adder especially. Others, mostly of brighter and more variegated colours, are not so dangerous. The insect world is, perhaps, in no other country so variously and widely distributed. The paucity of animals suitable for game and food, and the scarcity of song and other birds have led to the introduction of numerous well-known English animals and birds. Hares, rabbits, pheasants, partridges, quails, white swans, foreign ducks, thrushes, larks, &c., are now becoming quite plentiful; and rabbits in some parts have been found a serious pest from their number and destructive tendencies. Deer have been acclimatized. Victoria has paid the greatest attention to the breeding of sheep, and the production of wool has long been a far more important industry for the colony

than gold. The finest breeds of sheep have been introduced into the colony, many from New South Wales and Tasmania; and Victorian wools are now famous. So, undoubtedly, is Victorian wool, which, for length of staple, softness, and lustre, is admittedly unsurpassed. In the London market these wools always fetch the first price. Like the other Australian colonies, the Victorian sheep-breeder has occasionally considerable discouragements, mainly in the way of drought, which carries off his flock and diminishes the supply of his wool, but notwithstanding a decrease in the number of sheep, the export of wool has not diminished. The quantity annually exported now exceeds 100,000,000 lbs., valued at £5,000,000. The bulk of the wool goes to Great Britain.

In a country subject to frequent severe droughts the necessity of regulating the floods and storing the water was quickly apparent, and works to effect these objects have been carried out at an enormous cost. Reservoirs of immense capacities have been constructed, both for the supply of the towns and also in some places for the agriculturists and miners.

The climate of some parts of the colony, especially in the Ballarat district, was rapidly becoming much drier in consequence of the systematic denudation of the tree-covering to which the surface had been subjected; and an inspector of state forests has been appointed, whose duty it is to prevent the waste of timber and reckless destruction of live wood, and at the same time to establish nurseries of forest trees in various parts of the colony.

The disposal of the crown lands in Victoria is now regulated by an Act passed in 1870. Formerly large tracts were acquired by individuals, not for the purpose of cultivation, but to sell in smaller portions at greatly enhanced prices. Under the present Act, any person can select where he pleases 320 acres of land, under extremely favourable conditions—that is to say, by residing upon and improving the allotment selected, he is called upon to pay no more than 2s. per acre rental for three years; and at the expiration of that time he is allowed to become the owner of it on payment of 11s. per acre, which may be extended over seven years. Until the land is ultimately appropriated by purchase, much of it is let out by the government in sheep and cattle stations, or "runs," at a trifling rental.

**Mining.**—The colony of Victoria is justly celebrated for the wealth, extent, and variety of its mineral resources. Copper ore has been found at St. Armand, Bethanga, Specimen Gully, and on the river Thompson; in Gipps Land, where native copper is found associated with other ores of copper in the form of carbonates and pyrites; it also occurs in small quantities at Stiglitz, Castlemaine, Bendigo, and other places. At St. Armand and Bethanga are silver mines. Tin occurs in numerous places in the district of Beechworth, in the beds of tributaries of the Yarra, Thompson, and Latrobe; also at Taradale, Franklin (Gipps Land), and Strathbogie. Antimony, in the form of sulphuret and oxide, is found at Heathcote, Whroo, Anderson's Creek, Rutherglen, Maryborough, Costerfield, Ringwood, Merton, near Mansfield, and Nunawading, near Melbourne. Zinc has been found at Daylesford, also in Gipps Land; lead at Talbot, Avoca, and Gipps Land; cobalt at Yea; bismuth at Omeo and Tarrangower; manganese at Pleasant Creek, Daylesford, and Gipps Land; coal at Cape Paterson, Western Port, Gipps Land, Coleraine, and Mirboo; lignite has been found at Lal Lal, near Ballarat. Kaolin has been discovered at Bulla-Bulla, near Melbourne, and at Beechworth; bitumen near Portland; iron is found at Lal Lal. The other chief metals or metallic ores found in Victoria are:—Bismuth, cobalt, cadmium, manganese, molybdenite, osmiridium, and zinc-blende. These metals or ores have not yet been discovered in payable quantities. Diamonds and sapphires have been found in the north-eastern parts

of the colony, in what is known as the Ovens district, at or near El Dorado, the Woolshed and Pilot Creek, near Beechworth. But Victoria is chiefly remarkable for its gold, to which it owes its extraordinarily rapid progress: it has been stated that one-third of the total area of the colony may safely be considered as occupied by gold-bearing rocks. The gold occurs in quartz and alluvium; the latter was, of course, the first worked, surface mining being comparatively easy. This was, however, quickly exhausted, and some of the sinkings are now carried on at considerable depths.

Quartz reefing is now extensively followed, employing much machinery and a large amount of capital; and owing to the improvements in obtaining gold from the quartz, a yield of a few penny weights to the ton is found remunerative. Some of the quartz mines are now worked to a depth exceeding 2409 feet, and, so far as can be observed, there is little diminution in the yield of gold.

The colony is divided into large districts, known as Gipps Land, Murray, Wimmera, and Loddon.

**Population.**—The white population of Victoria in 1836 was only 177. In 1838 it was 3511, and in subsequent years as follows:—11,738 in 1841; 32,879 in 1846; 77,315 in 1851; 236,776 in 1851; 410,766 in 1857; 510,322 in 1861; 616,375 in 1865; in 1871, 731,528; and in 1881 it was 862,316—viz., 452,083 males and 410,263 females. The number was estimated to have increased to over 1,000,000 in 1888. In 1881 the aborigines were returned as 780; and the Chinese, who are rapidly decreasing, 12,128.

**Revenue and Expenditure.**—The revenue and expenditure of the colony each amount to about £6,800,000 per annum. The revenue is chiefly raised from customs import duties, sales and rent of land, and the railways, which belong to the government. The debt of Victoria amounted in 1888 to about £30,000,000, nearly the whole of which was subscribed in Great Britain. It was incurred solely for the construction of public works, particularly railways. The interest on the loan and repayment of part of the principal, and the expense of working the railways, are the largest items in the expenditure of the colony. The naval and military forces consist of 4000 artillery and rifle volunteers, one ironclad turret-ship, one wooden man-of-war, two gunboats, three torpedo boats, and a small naval reserve.

**Imports and Exports.**—The following are the values of the exports and imports from 1883 to 1886:—

Years.	Imports. Total Value.	Exports. Total Value.
1883	£17,743,846	£16,398,863
1884	19,201,633	16,050,465
1885	18,044,604	15,551,758
1886	18,550,575	11,795,321

The chief exports are gold and wool, but large quantities of preserved meat, tallow, hides, and skins are also shipped. The principal imports are apparel and haberdashery, beer and cider, cotton, linen, silk, and woollen goods, hardware, spirits, sugar, tea, tobacco, and wine. The trade is almost exclusively confined to Great Britain and her various colonies.

**Manufactures.**—Very many things are now manufactured in the colony that were formerly exclusively imported, and these industries have been materially aided by the heavy protective tariff now in force. Among the articles and preparations may be instanced account books, diaries, and other manufactured stationery, dyes, glass, cloth, paper, cigars, starch, pianos, furniture, carriages, clothing, organs, chemicals, blasting material, oilmen's stores, safes, brushware, soap, agricultural implements, &c.

**Railways, &c.**—Victoria has a more extensive system of railways than any other of the Australian colonies. In 1888 there were 1900 miles of line open. All the railways are the property of the state.

To Victoria is due the credit of having laid the first line of electric telegraph in the southern hemisphere. This was a line from Melbourne to Williamstown, which was opened in 1854. There is now not only a network of telegraphic communication between the metropolis and every town of importance in the colony, but wires are also carried over the borders and connected with those of the adjacent colonies, leading to the capitals of South Australia, New South Wales, and Queensland, and a submarine cable connects the colony with Tasmania. The Victorian lines were all constructed and are still worked by the government. The line of wire laid by the South Australian government across the Australian continent to Port Darwin, where it is connected with the submarine cable to Java, places Victoria, as well as the other Australian colonies, in direct communication with Great Britain and the other countries of the Old World. Telephonic communication is being largely introduced, and postal orders can be sent by telegram.

**Constitution and Government.**—Victoria is under the control of a governor appointed by the British government, whose term of office is seven years, and of an executive council and two houses of Legislature. The executive consists of the governor of the colony and the ministry for the time being.

By the Reform Bill of 1881 the number of provinces was increased from six to fourteen for the representation of the Legislative Council. Each province returns three members, or forty-two in all, serving for six years, one-third retiring biennially. The franchise has been reduced from £50 for freeholders and occupiers to £10 for the former and £25 for the latter. The number of the electors has been increased to 107,914. Candidates must possess freehold property of the annual value of £100, or capital value of £1000; and voters a freehold rated at not less than £10 per year, or a leasehold rated at not less than £25.

The Legislative Assembly consists of eighty-six members, representing fifty-five electoral districts, containing, according to the latest return, 215,830 electors, including 35,993 non-ratepayers, and it is triennial in its duration. A member's qualifications are:—He must be of full age, have lived in the colony two years, and be either a British subject or a naturalized one. By an Act passed in 1870, which was to remain in force for three years only, members of Parliament are paid £300 per annum for "reimbursing their expenses." The qualifications of a vote are so small that the system may be considered one of universal suffrage. The would-be voter must be a male person of twenty-one years of age (not subject to any legal incapacity), a naturalized or denizen subject of the queen, and have resided in Victoria twelve months previous to the first day of January or July in any year, or have been naturalized at least three years. All voting is by ballot.

**Religion and Education.**—There is no state church in Victoria, all denominations being on an entirely equal footing. The census returns of 1881 thus classified the people according to their respective creeds—311,291 Episcopalians (including 11,639 Protestants not otherwise defined), 132,591 Presbyterians, 108,393 Wesleyan Methodists, 19,878 Independents or Congregationalists, 20,373 Baptists, 11,149 Lutherans and German Protestants, 4859 "Christians" (Church of Christ), 172 Moravians or United Brethren, 712 Calvinists and Calvinistic Methodists, 282 Members of the Society of Friends, 942 Unitarians, 1079 other Protestants, 203,480 Roman Catholics (including 6426 Catholics not otherwise defined), 383 Catholic and Apostolic Church, 103 Greek Church, 238 Israelites and

Christian Israelites, 15 Mormons or Latter Day Saints, 4330 Jews, 17,089 of other sects (including 11,159 pagans), 4979 of no denomination, 2607 of no religion, 6547 unspecified, and 8598 who objected to state their religion.

The charitable institutions of Victoria are numerous and various. Many of them are subsidized by the state, and they are also largely contributed to by private individuals. Among them is an institution in Melbourne partaking of the nature of a benevolent asylum, called the Immigrants' Home. It was founded for the purpose of affording relief and accommodation to new arrivals, but it now assists all who are in want, without reference to the period of their residence in the colony.

The system of public primary education in Victoria is free, secular, and compulsory, the Act establishing it having come into force on the 1st January, 1873. The department is under a minister of education, who is alone responsible to Parliament and the country, in whom (or his successors) all school properties are vested, and, virtually, at whose disposal are the appointment and dismissal of officers. Attendance at the schools is compulsory between the ages of six and fourteen years; the attendance to amount to sixty days in each half-year, any of the following reasons only being a valid excuse for non-attendance:—Efficient education elsewhere; sickness, fear of infection, or any unavoidable cause; if there be no state school within two miles; if a child be educated up to the standard. This provision of the Act is enforced by "truant officers," whose special business it is to hunt up defaulting parents and compel them to have their children educated. The instruction imparted is severed from all connection or special arrangement with the religious denominations, is secular in the sense of not being distinctively religious, and is free in certain prescribed subjects, other subjects being allowed to be taught on the payment of small fees, fixed by regulations. Every school locality is termed a school district, which for local purposes is presided over by a board of advice.

There is a flourishing university at Melbourne, and several grammar schools and colleges. There are also ragged, industrial, and reformatory schools, conducted on the same principle as similar institutions in Great Britain.

*History.*—Victoria, then part of New South Wales, was discovered by Captain Cook in April, 1770. The eastern part of the coast line, as far as Western Port, was first visited by Mr. Bass in 1798, and the southern coast, to near the South Australian boundary, by Captain James Grant in 1800. The inlet of Port Philip was discovered by Lieutenant Murray in 1802. A convict settlement was formed at Port Philip in 1803, and was shortly after abandoned, as was also a similar settlement at Western Port in 1826. The actual settlement of Port Philip was commenced by convicts from Tasmania in 1835; and the admirable grazing capabilities of the new territory soon attracted attention, so that squatters poured in rapidly; but it was not till 1851 that it was separated from New South Wales. The discovery of gold immediately after that event had the effect of making it one of the most prosperous and successful of all the British colonies; its progress has, in fact, surpassed almost everything of the kind ever known.

**VICTORIA.** See HONG KONG.

**VICTORIA**, the capital of Vancouver Island. See BRITISH COLUMBIA.

**VICTORIA**, in botany, is a genus of aquatic plants, belonging to the order Nymphaeales, and containing a single species, *Victoria regia*, of remarkable interest and beauty. This royal water-lily is a native of the rivers of tropical America, and is found especially in the tributaries of the Amazon. It has a thick fleshy root-stock, which lies embedded in the mud and sends up numerous long

cylindrical leaf-stalks, bearing very large leaves, which float on the surface of the water. The leaf-stalks contain large air-canals, and are covered with stout conical prickles. The leaves are peltate, circular in outline, and, when fully developed, measure from 6 to 12 feet in diameter; their margins are uniformly turned upwards to an extent of 2 or 3 inches. The upper surface of the leaf is of a rich green colour, and is covered with tubercles; the under surface is purplish, and exhibits a network of very prominent veins, which are traversed by air-canals and covered with prickles. The buoyancy of these leaves, which float on the water like huge trays, is so great that they will support the weight of a child. The flowers rise among the leaves on stout prickly flower-stalks, which also contain air-canals. They are over a foot in diameter, very fragrant, and of great beauty. The limb of the calyx is divided into four deciduous purplish sepals: its tube is adherent to the ovary and covered with prickles. The petals are very numerous, the outer being oblong and white, while the inner are narrower, more pointed, and rose-coloured, and pass gradually into the stamens, which are numerous and similar in colour to the inner petals, the innermost being barren, paler, and arching over the stigmas. When the flower expands the outer petals are bent downwards, while the inner are erect, forming with the stamens a beautiful rose-coloured coronet. The fruit is a globular prickly berry, about half the size of a man's head, containing numerous round fatigaceous seeds, which are eaten roasted. Hence the Spanish name for the plant, *Mais del Agua*, or water maize.

This superb plant was first discovered by Haenke, in 1801, and afterwards by Bonpland, Pöppig, and D'Orbigny. Little was known of it, however, until it was seen by Sir Robert Schomburgk, in 1837, during his travels in Guiana and Demerara, at a point where the river Berbice expands into a fine secluded lake. Here he found this most magnificent of the water-lily tribe, in every stage of development, from the conical brown bud, whose opening leaves just discovered the creamy petals within, to the rosy splendour of the fully developed flower. In compliment to his sovereign Sir Robert named it the *Victoria regia*.

Some plants were imported into England, and have been successfully cultivated at Chatsworth, Kew, the Botanic Gardens of Glasgow, and elsewhere. They have also been introduced into India from seeds obtained in England. The genus *Victoria* is most nearly allied to *Euryale*, from which it is chiefly distinguished by the deciduous sepals, and the gradual transition in form of the petals to that of the stamens.

**VICTORIA BRIDGE**, the greatest tubular bridge in the world, is thrown across the St. Lawrence at Montreal, and carries the Grand Trunk Railway. It was constructed in 1854-59, under the direction of Robert Stephenson and Alexander M. Ross, engineers. Its total length is 9144 feet, or nearly  $\frac{1}{2}$  mile. It consists of twenty-four spans, each span measuring from 242 to 247 feet, and one extending to 330 feet. The bottom of the central tube is 60 feet, and at the abutments the bottom is 36 feet above the water, giving a rise of 1 in 130 in the roadway towards the middle of the bridge. The greatest depth of the river at this point of its course is 22 feet, and the current runs at the rate of 7 miles per hour. In the construction of this magnificent memorial of engineering skill 9000 tons of iron were used for the tubes alone; in the temporary works and dams 2,713,095 cubic feet of masonry and 2,280,000 of timber were consumed. Upwards of 3000 men were employed, and the total cost was about £57 per lineal foot, or £1,400,000.

**VICTORIA CROSS.** In most civilized nations there exists some means of specially rewarding the individual gallantry and daring services of those who fight for their country, apart from the general medal granted to every one

engaged in a particular action or campaign. On the termination of the Crimean War the want of a recognized dignity to mark such services was much felt in England, especially as our French companions in arms were rewarded, in cases of distinguished service, by the cross of the Legion of Honour. To attain an end so desirable a new naval and military decoration was created, to be known as the "Victoria Cross," consisting of a Maltese cross of bronze (formed from the cannon captured at Sebastopol), with the royal crest in the centre, and underneath a scroll, bearing the inscription "For valour." On the clasp are two branches of laurel, and from it the cross hangs, supported by the initial "V." It was ordained, with a view to place every man on a perfectly equal footing as to eligibility for the decoration, that neither rank, nor long service, nor wounds, nor anything save the merit of conspicuous bravery should entitle to the honour. The cross is ordered to be suspended from the left breast by a blue ribbon for the navy and red for the army. The names of those receiving it are published in the *Gazette*, and entered on a registry kept by the secretary for war. Should any one, after having received the cross, again distinguish himself in a manner such as would entitle him to the decoration had he not already received it, such further act is recorded by a bar attached to the suspending ribbon, an additional bar being added for each additional act of bravery. This distinction carries with it a special pension of £10 a year, and each additional bar entitles to an extra £5 a year. Should the wearer be at any future time convicted or reasonably suspected of treason, cowardice, felony, or any infamous crime, the honour is forfeited, his name is erased from the registry mentioned, and his pension ceases. The first distribution of Victoria Crosses took place under the auspices of the queen in Hyde Park on the 26th June, 1857, the recipients, sixty-two in number, having won them in the Crimean War.

We may add that an Albert Medal was instituted in 1866 for the reward of bravery displayed by civilians in saving human life, chiefly from drowning; and a memorable instance of the use of this distinction was when it was conferred on the coal miners in South Wales who, in the year 1877, rescued their fellow-workmen from the inundated Tynewydd Colliery (at the imminent risk of their own lives), after they had been imprisoned for ten days!

**VICTORIA FALLS**, the chief falls of the ZAMBEZI RIVER, in Central Africa, and in some respects one of the most imposing waterfalls, situated in 25° 30' E. lon.

**VICTORIA LAND**, the name given to the supposed Antarctic continent discovered by Sir James Ross in 1841. Near its north extremity, in 168° 12' E. lon., are Mount Erebus, an active volcano, 12,369 feet high; Mount Terror, 10,884 feet; Mount Melbourne, 15,000 feet; and Mount Henschell, 13,000 feet.

**VICTORIA NYANZA**, a great lake of Eastern Central Africa, the largest in the continent, and about equivalent in size with Lake Michigan or Huron. It was discovered by Captain Speke in 1858 and 1860, and explored by Stanley in 1875. It is bisected by the equator, and extends from about 2° 40' S. to 0° 30' N. lat., 31° 40' to 31° 40' E. lon. Its area is 26,500 square miles, and it is situated 4168 feet above the sea-level; greatest measured depth, 580 feet. Its west, south, and north shores are low and marshy, the east is much bolder, and the whole is greatly indented. It contains numerous islands near the coasts, the largest of which are Ukeruwa, in the south-east, and Sasse or Sesseh, in the north-west. This lake forms the head reservoir of the Nile, which issues from its northern shore; it receives a large number of streams on all sides, the largest being (as far as known) the Shineeyu, from the south, and the Kagera, or Kitangule, from the south-west, which may be considered the ultimate sources of the Nile.

**VICTORIA UNIVERSITY, MANCHESTER**, the youngest of our universities, was founded by royal charter, dated 20th April, 1880. The first college in the university, and for some time the only one, was Owens College, Manchester, and it is as a development of this great teaching institution that the university may be considered.

Owens College had its origin in a bequest made by John Owens, merchant, of Manchester, who died 29th July, 1846. By his will the testator directed, after special bequests to various persons and charities, that the residue of his estate should be applied "for providing or aiding the means of instructing and improving young persons of the male sex in such branches of learning and science as were then, and might be, usually taught in the English universities," but subject to two fundamental and immutable conditions—first, that students, professors, and teachers, and others connected with the institution, should not be required to make any declaration, or submit to any test as to their religious opinions; and, secondly, that preference should be given to children whose parents resided in the parliamentary borough of Manchester. Various difficulties, chiefly in connection with the realization of the estate, retarded the formation of the new institution, and it was not until the 12th March, 1851, that the college was opened, in premises leased from Mr. Richard Cobden.

By royal warrant of 29th May, 1851, the college was empowered to grant certificates, qualifying students for examination for degrees at London University, and this connection with London continued until the creation of Victoria University in 1880. The amount received from Mr. Owens' estate amounted to about £97,000, and in the year following the opening of the college its funds were enriched by upwards of £10,000 subscribed by 118 merchants and others connected with Manchester. Numerous and valuable benefactions have from time to time given evidence of the enlightened generosity of the citizens of Manchester and their interest in the institution. Chief among these was a bequest by Mr. Charles Frederick Beyer, who died in 1877, leaving upwards of £100,000 to be devoted to the college purposes.

A proposal for the extension of the original scheme was made in 1865, but owing to the unparalleled depression in trade no active steps were taken until two years later, when a meeting of the citizens decided in favour of a vigorous prosecution of the movement. An appeal to the public followed, and sufficient funds were obtained to enable the committee of the Owens Extension College to purchase a site and commence building operations. An Act of Parliament being necessary to modify the conditions of the original foundation, a Bill was introduced with this object, which, after much opposition, was passed, and received the royal assent in 1870. In the following year an Act was obtained by which the educational institution founded by John Owens became merged into and amalgamated with the Owens Extension College, the amalgamated colleges taking the name of the Owens College. A governing body was formed, under the style of the court, of which the Duke of Devonshire became president.

In 1875 Professor Ward invited the governing body to consider the expediency of seeking for the college a charter, as a national university enjoying the right of conferring its own degrees. The proposal was warmly received and soon took practical shape. Much opposition, however, had to be encountered, and many unforeseen difficulties arose. These were finally overcome, and the efforts of the promoters crowned with a large measure of success in April, 1880, by the grant of a charter creating the Victoria University, having its seat in Manchester, with power to confer degrees in all subjects, except medicine and surgery. This restriction was, however, removed by the grant of an additional charter, dated 20th March, 1883, since which date the university has enjoyed equal power with the older

universities of conferring degrees in all branches of learning. By the charter Owens College was specially constituted the first college in the university. The first chancellor of the university was the Duke of Devonshire, president of Owens College, and the first vice-chancellor was Professor J. G. Greenwood, principal of the college. The vice-chancellor holds office for two years. The queen is the visitor of the university. The characteristic features of the Victoria University, compared with other British universities, are:—(a) It does not, like London, confer its degrees on candidates who have passed examinations only, but it also requires attendance on prescribed courses of academic study in a college of the university; (b) the constitution of the university contemplates its becoming a federation of colleges, but these colleges will not be situated, like those of Oxford and Cambridge, in one town, but wherever a college of adequate efficiency shall have arisen. Thus, the University College, Liverpool, having fulfilled these requirements, has been admitted into the university. In November, 1887, the Yorkshire College became a college in the university.

The Victoria University, like the older universities of England and Scotland, is at once a teaching and examining body, and there is an intimate connection between the teaching and examining functions. To give it a general or national character, the governing body consists partly of persons nominated by the crown, and partly of the governing and teaching bodies of the colleges, and of the graduates of the university. External examiners are appointed, and all examinations are conducted jointly by such external examiners and examiners representing the teaching body. The graduates of the university meet its teachers in convocation to discuss the affairs of the university. Convocation will elect future chancellors, and now elects a certain number of representatives on the court; its influence in the government of the university will increase with its numbers. On degree day, held at the Manchester Town Hall, 3rd November, 1887, degrees were conferred upon thirty candidates, of whom four were ladies, that being the first occasion on which ladies obtained degrees in the university.

#### VICUNA. See LLAMA.

**VIELLE** is sometimes met with in mediæval manuscripts in the sense of *viol*, but far more often means *hurdy-gurdy*. A very beautiful instrument, inlaid and carved with hunting-scenes and arabesques, and belonging to the famous Catherine de Medici, queen of France, with the date of manufacture (1559), is in the South Kensington Museum, London. Another example in the same museum is inlaid with tortoise-shell and gold piqué work, with ivory and wood figure-carvings, &c. From these beautiful instruments to the rough hurdy-gurdy of the itinerant Savoyard is indeed a heavy fall.

The *vielle* was not always in viol form; there were many who preferred the *vielles-en-luth*. Both were superseded later on by the *vielles-en-guitare*, which gave a sweeter tone. In fact the *vielle* was bowed, or plucked, or played by the wheel, being easily convertible to either use in the course of manufacture.

For an explanation of the mechanism of the wheel-form of the instrument see the article **HURDY-GURDY**.

**VIENNA** (in German *Wien*, but locally *Kaiserstadt*, or "The Emperor's City," and the *Vindobona* of the Romans), the metropolis of the Austrian Empire, is situated on the right or south bank of an arm of the Danube, into which the dirty little river Wien, from which the city is named, discharges itself on the east side of the old city. Vienna is 390 miles W.N.W. of Milan, 800 north-west of Constantinople, 137 north-west of Pesth, 310 S.S.E. of Berlin, 380 E.S.E. of Frankfurt, 250 south-east of Prague, and 600 east by south from Paris. The population in 1886 was 726,103, or including the suburbs 1,103,857.

The inner or old city of Vienna is nearly circular, and

not above 3 miles in circumference. It was formerly surrounded with a broad fosse, and a wall from 40 to 50 feet high; but they are now removed, and all around the city proper is a space varying in width from 960 to 1500 feet, which was once the glacis of the fortifications, and reserved as a clear space without the walls, but is now planted with grass and laid out in public walks, having fine avenues of acacia and chestnut trees, and adorned with magnificent buildings. With the levelling of the fortifications the distinction between city and suburbs ceased, and Vienna was divided into nine districts viz.—*Innerer Stadt*, *Leopoldstadt*, *Landstrasse*, *Wieden*, *Margarethen*, *Mariahilf*, *Neubau*, *Josefstadt*, and *Alsergrund*. All but the second are on the right bank of the Danube. The *Innerer Stadt*, still called the city, comprises the oldest part of Vienna, the largest squares and most notable edifices, and the new and beautiful quarter which has risen on the site of the fortifications and the broad glacis which encircled them. The *Ringstrasse*, a series of boulevards lined with palatial buildings and planted with trees, forms a belt around this part of Vienna, 2½ miles long and 186 feet wide. Parallel with it runs the *Lastenstrasse*, for the accommodation of the heavy traffic; and a third belt, the *Gürtelstrasse*, runs along the low ramparts thrown up in the beginning of the eighteenth century, marking the limits of the municipal territory. The area thus included has a circumference of 16 miles, and contains about 11,000 houses.

The inner, or old city, was formerly very irregularly built, and many of the streets are still crooked and narrow, but Vienna, altogether, has seen an architectural revolution more extensive, perhaps, than in any other European capital, Paris excepted, and it is now certainly one of the most attractive capitals of Europe. The situation of the city is about 180 feet above the sea, and as, in the south part, it rises from the Danube in terraces, a considerable declivity is given to many of the streets. Other parts of the city are, however, so little above the level of the river that they are occasionally liable to inundations. To remedy this, and also to make the city a more important centre of communication in Central Europe, a most important work was commenced in 1870, which is certainly one of the most remarkable of the kind ever achieved. The plan was to make for some distance a new bed for the river, and the bold project was accomplished in 1875; while on its side has arisen the great commercial Vienna, which by this means has the advantage of becoming a great central *entrepôt*, with docks and every convenience for an active navigation. The *Places* (open places or squares) are many of them very well laid out. Among the best are the *New Parade*, the *Hof*, the *Hofe Markt*, the *Josephplatz*, the *Graben*, and the *Burgplatz*. The *New Parade* is nearly 1000 feet in length and 650 in breadth, perfectly regular, surrounded with avenues of trees, and laid out with grass plots and flower beds. Some of the squares are adorned with fine fountains and statues. Among the latter are handsome equestrian statues of Joseph II., Prince Eugene, and the Archduke Charles, and a colossal bronze statue of the Emperor Francis. A statue of Haydn, the musical composer, who died at Vienna in 1809, was erected in 1887. The streets in the suburbs are broad and straight, all converging to the centre of the old city. Water-works were opened in 1873. The water is brought from the Alps—a distance of 54 miles—by means of tunnels and aqueducts. Other sanitary reforms since carried out have greatly improved the health of the city.

The public buildings, palaces, churches, &c., are very numerous. The most remarkable is the cathedral, dedicated to St. Stephen, which was restored in 1864; it is a beautiful structure, 342 feet in length and 222 in breadth between the two great towers. One of the four towers or steeples is 465 feet high, the loftiest in Europe with the exception of that of Strasburg, and is a masterpiece of



Gothic architecture. The interior is enriched with numerous beautiful altars and monuments. It stands on the site of an older church, parts of which still remain, and was built between the years 1359 and 1480. It contains a bell, weighing 18 tons, cast from cannon taken from the Turks in 1711. St. Peter's, built on the model of St. Peter's at Rome, is adorned with fine frescoes and oil paintings. The elegant church of the Augustines contains the celebrated mausoleum of the Archduchess Christina, a masterpiece of Canova, which cost 20,000 ducats. The great Votive Church, a reduced reproduction of Cologne Cathedral, a grand and pretentious building, was commenced in 1856 and completed in 1867. It is situated outside the old city, and was subscribed for in all parts of the empire as a monument of gratitude for the preservation of the emperor's life from attempted assassination. Many of the other churches are remarkable either for their beauty or their antiquity. The Jews have several synagogues, one of which has a most magnificent interior. The Burg, or imperial palace, is an old irregular edifice, built at different times, and consisting of three quadrangles; it contains the imperial jewel office, one of the richest collections of valuable curiosities in Europe, a fine cabinet of works of art, a very extensive collection of natural history, and the cabinet of medals, which far surpasses all other collections of the kind. The Imperial Library, connected with the Burg, is a handsome edifice, with a saloon, and a gallery 250 feet long, and in the centre 100 feet broad, in which is the library, consisting of above 310,000 volumes and 16,000 manuscripts. It is rapidly increasing, as a copy of every book published in the empire must be sent to it. The building formerly called the imperial chancery, the imperial riding school, the splendid palace of the Archduke Charles, containing an extensive library and a collection of 180,000 engravings (among them being Raffaele's own sketch of the "Transfiguration"); the mint, the university, the town-house, the archbishop's palace, the imperial arsenal (which contains manufactories of all kinds of weapons, and an armoury containing one of the largest and finest collections of arms and armour in Europe); the city hospital, the great arsenal, the bank, the chanceries, the custom-house, the Heinrich's Hof, and the opera-house are among the large public buildings of Vienna. The palaces of the nobility are numerous, and most of them contain good collections of paintings and other works of art. The Ambras Museum has a good collection of armour and art treasures, and some fine pictures by Raffaele, Salvator Rosa, Paul Veronese, Titian, the Caracci, Correggio, Rubens, Van Dyck, and others. Strangers are readily admitted to all the public institutions in the city. There are several excellent theatres, and the new opera-house is one of the finest and best arranged buildings of the kind in Europe.

The hospital and other charitable institutions are numerous and well endowed. The general hospital, founded by Joseph II., is a very large building, containing nearly 3000 beds. The lying-in hospital, the foundling hospital, the lunatic asylum, the deaf and dumb asylum, the hospital of the Charitable Brothers, and the invalids' house, are also all large institutions.

Vienna is the see of an archbishop. The principal establishment for education is the university, founded by Duke Rudolph IV. in 1365, but entirely remodelled by Maria Theresa. It has by degrees become the first medical school in Germany, if not in the world; it is largely attended, and has a library of 120,000 volumes, an observatory, a botanic garden, an anatomical theatre, a veterinary school, a laboratory, and other appendages. The Josephinum, founded by Joseph II., is a medical institution for the instruction of surgeons for the army, with very rich collections. Other establishments worthy of notice are, the Imperial Oriental Academy, the Academy

of Engineers, the Academy of the Fine Arts, the Normal School, and the Polytechnic Institution, which is attended by about 500 pupils, who are educated in science, the arts, trades, and manufactures. There are also numerous very excellent schools in the city.

Vienna being the centre of the Austrian dominions is likewise the principal seat of commerce and manufactures. Its trade is with Hungary, Turkey, Italy, and other countries. Manufactures of every kind are carried on in the city, and employ above 100,000 workmen. The principal are silk, velvet, shawls, meerschaum pipes, in which much taste is displayed, gold and silver lace, cottons, woollens, ribbons, carpets, leather, porcelain, jewelry, mathematical and musical instruments, fire-arms, gold and silver plate, watches, fine cutlery, carriages, gloves, lace, straw-hats, paper, &c.

The suburbs contain numerous palaces and gardens of the nobility, churches, and convents. There are several bridges in Vienna; two of them, the Aspern over the Danube Canal, and the Schwarzenberg over the Wina, though small, are remarkable works, and not surpassed for elegance of design by any bridges recently constructed in Europe.

The public promenades, which are the great places of resort for the citizens of Vienna, are the esplanade between the city and the suburbs: the Volksgarten (the people's garden); the private gardens of the palaces of Liechtenstein, Rasumowsky, Schwarzenberg, and the Belvedere; and the Prater, in the suburb Leopoldstadt, which is an immense park. The Prater is a league and a half in length, and is traversed by six noble avenues of chestnut trees, running in different directions, the principal one being 15,000 feet in length. It is divided into three parts: one for horsemen, one for pedestrians, and the broad road between them for carriages, and is by far the gayest place in Vienna. Altogether the Prater is so extensive and so beautifully laid out that it is considered one of the finest public parks in Europe. Near it is another open spot of a humbler description, called the Wurstel Prater, covered with innumerable liquor shops, Russian swings, roundabouts, jugglers, and all sorts of diversions for the lower classes, who, on Sundays and holidays in the afternoon, repair thither in throngs. Adjoining the Prater is the Augarten, and next to that the Brigittenau, which are very agreeable walks, but not so frequented as the Prater. The Viennese are exceedingly fond of amusement, especially music, and the pursuit of pleasure seems one of the main occupations of the great mass of the people. The city is said to contain more places of amusement than any other capital in Europe.

Great lines of railway extend from Vienna N.E. to Warsaw; north-west through Prague, Dresden, and Berlin to Hamburg; east through Pesth to Debreczin; and S.S.W. to Trieste.

The immediate surroundings of Vienna offer charming scenery. The heights of the Leopoldsberg and Kahlenberg command a view extending to the Styrian Alps on the south and the Carpathians on the east. The famous gardens of Schönbrunn, the summer residence of the emperor, about 3 miles south-west of the city, are laid out in the formal style of the last century; they contain a menagerie and a botanic garden, with an extensive collection of tropical plants. The Castle of Laxenburg, 9 miles south of Vienna, possesses many curious relics of feudalism, and is surrounded by a fine park. Near by is the romantic Brühl valley, with the ruins of ancient strongholds. A few miles further south is Baden, with celebrated sulphur springs, which were known to the Romans.

Vienna appears to have been a Roman station in the first century, and to have borne the name of *Fabiana*. It was afterwards included in Upper Pannonia, and received the name of *Vindobona*. On the decline of the Roman Empire

It experienced the common fate, and was pillaged by the Goths and Huns. At a later period it formed part of the empire of Charlemagne, who erected it into a bishopric, and contributed much to its prosperity. Under him it became the capital of a margraviate, and the surrounding territory received the name of Austria or Oester-reich, the Eastern Kingdom. Its first margraves were princes of the Babenberg family, who afterwards changed their title to that of dukes, and continued to rule till the thirteenth century, when the line became extinct. Vienna then came into the possession of Ottokar of Bohemia. By him it was greatly increased in extent, and improved in appearance; but in consequence of his refusal to acknowledge the election of the Emperor Rudolph, it was subjected to a six weeks' siege. Not long after it passed, with Austria itself, to the house of Hapsburg. In 1481 Matthias, king of Hungary, gained possession of it, and made it the seat of his court. Under the Emperor Maximilian I. it became the capital, and has ever since been the habitual residence of the head of the Austrian dynasty. In 1529 a host of Turks, mustering 120,000 men and 300 pieces of cannon, and headed by Solymán the Magnificent, appeared before the walls, burned the suburbs, and battered down a great part of the city; but the defence, though conducted by only 16,000 regular troops and 4000 citizens, was so valiant that the assailants were forced to retire. Before the disasters which they had caused were thoroughly repaired the plague visited the city in 1676, and carried off 120,000 persons in eleven months. In 1683 the Turks re-appeared, with a still more formidable host than before, commanded by the grand-vizier Kara Mustapha. The defence was most valiantly conducted for two months by Count Rudiger of Starheimberg, but had become almost hopeless when the celebrated John Sobieski suddenly appeared with his Poles, and the Turkish host was almost annihilated. A long period of rest and prosperity followed. The French took the city in 1806 and in 1809. The Congress of Vienna, which fixed the limits of many of the countries of Europe, was held here from November, 1814, to June, 1815. The City was held by the revolutionary party for a short time in 1848; the barricades were raised on the 6th of October, but it was surrendered to the imperial troops on the 30th of the same month, having suffered severely from a bombardment. Six miles east of Vienna is Wagram, celebrated for the defeat of the Austrians by the French, under Napoleon I., in 1809.

**VIENNA, TREATIES OF.** Owing to the important share which Austria has always taken in the great wars of Europe, Vienna, her capital, has been very frequently chosen as the rendezvous of plenipotentiaries and diplomats bent on composing strife and securing peace, and several treaties of historic interest and value have here been concluded. We may enumerate the following:—

*30th April, 1725.*—Between the Emperor Charles VI. and Philip V. of Spain. The former agreed to assist the latter in attempting the recovery of Gibraltar from Great Britain, and to support the Pretender (Prince James Edward) in ousting George I. from the British throne.

*16th March, 1731.*—George II. of Great Britain and the United States of Holland made themselves parties to the so-called Pragmatic Sanction, which guaranteed the Austrian possessions to Maria Theresa, queen of Hungary. This treaty, in 1756, embroiled England in the great European struggle known as the SEVEN YEARS' WAR, in which Austria was supported by Russia and France against Prussia, assisted by England.

*18th November, 1738.*—Louis XV. of France, in like manner became a party to the Pragmatic Sanction, in consideration of the surrender, after the death of Stanislas, ex-king of Poland, of Lorraine and Bar to France. The stipulations of this treaty were quickly broken by the French government.

*14th October, 1806.*—After the disastrous battle of

Wagram, Austria was compelled to resign to France Friuli, Trieste, Carniola, and portions of Croatia, Carinthia, and Dalmatia, the whole to be formed into the government-general of Illyria, and attached to the (French) kingdom of Italy; Upper Lusatia was ceded to Saxony; Western Galicia, with Cracow, Zamocz, and a share in the salt mines of Wichiza, to the grand duchy of Warsaw; and Eastern Galicia to Russia. Austria thus lost the entire Adriatic coast, her rank and resources as a naval power, and a territory of 58,170 square miles, with a population of 3,500,000.

*9th June, 1815.*—This was the result of the deliberations of the famous Congress of Vienna, which assembled, after the downfall of Napoleon, to settle the affairs and regulate the subdivision of Europe. It was attended by about 500 representatives of the European powers. Austria was represented by Prince Metternich; Great Britain, by Lord Castlereagh, and afterwards by the Duke of Wellington; France, by Prince Talleyrand; Prussia, by Count Hardenberg; and Russia, by Count Nesselrode. The affairs of the congress were virtually settled by a council within the council, a kind of private committee, attended only by the representatives of Great Britain, Austria, Prussia, Russia, Spain, Portugal, and Sweden. The first meeting was held 20th September, 1814. The chief points settled by this important congress were:—The restoration of her losses to Austria, of Savoy to Piedmont, and of Hanover to Great Britain. France was reunited to her former boundaries; Norway was annexed to Sweden; Belgium and Holland formed into one kingdom (that of the Netherlands). The free navigation of the Rhine was established, and the ancient constitution of Switzerland restored. Genoa was incorporated with Sardinia; Prussia obtained Swedish Pomerania and the greater part of the left bank of the Rhine. The settlement sanctioned by the congress has since been disturbed in many points. First Belgium threw off the yoke of Holland, and her independence was recognized by England; Russia, Prussia, and Austria divided Poland among themselves, contrary to the stipulations which had provided for the erection of the latter into a kingdom attached to Russia, as Hungary is to Austria; whilst the events of the last thirty years have completely disarranged the map of Europe, and the treaty of Vienna is no longer worth the parchment upon which it was inscribed.

**VIENNE**, a town of France, in the department of Isère, at the foot of a hill on the left bank of the Rhone, 18 miles W.N.W. of Grenoble. It has been greatly improved in modern times, and has a handsome quay. There are manufactures of iron and copper ware, woollens, and cartridge paper. It has an interesting cathedral, a museum in a Roman temple, with a library of 7000 volumes, and several other Roman remains. The population in 1886 was 25,480.

HEROD ARCHELAOS was banished from Judea to Vienne by Augustus in the year 9 A.D., and to this place also PONTIUS PILATE was banished by Tiberius, about 38 A.D. It became the seat of one of the earliest Christian churches in Gaul, and was the cradle of Christianity in the West; the "Epistle of its early Martyrs" to their brethren in the East is a very instructive and authentic document. Vienne was the capital of the first kingdom of Burgundy in the fifth century, and at a later period the residence of the Dauphins. A celebrated ecclesiastical COUNCIL, held here in 1312, and presided over by Pope Clement V. and Philippe le Bel, condemned the Order of the Templars.

**VIENNE**, a department in France, formed out of part of the old province of Poitou, is bounded N. by Maine-et-Loire and Indre-et-Loire, E. by Indre, S. by Haute-Vienne and Charente, and W. by Deux-Sèvres. Its greatest length is 80 miles; its greatest breadth, 51 miles. The area is 2700 square miles, and the population in 1886 was 312,785.

*Physical Aspect.*—It has no very elevated land; the Gâtine Hills, which extend from the mountains of Auvergne



towards the mouth of the Loire, cross it in the south-west; and a branch from these stretches towards the north-east between the Clain and the Thoué, subsiding, however, into the valley of the Loire before reaching the northern boundary. The central part, between the Clain and the Vienne, consists of tolerably high ground, but the part east of the latter river is low.

*Hydrography.*—The department belongs to the basin of the Loire, except the south-west corner, about Civray, which is drained by the Charente. The Vienne, which is one of the principal affluents of the Loire, rises in Corrèze; after crossing Haute-Vienne and a part of Charente it enters Vienne on the south, just above Auvillais, and flowing northwards, quits it below the junction of the Creuse. This river is navigable for about 40 miles from the point where it receives the Clain to its entrance into the Loire in Indre-et-Loire. Nearly all the other streams are tributaries of the Vienne, but not one of them is navigable except the CREUSE. The Clain rises in Charente, but has nearly the whole of its course of more than 60 miles in Vienne. It passes Poitiers and Vivonne. The Dive, a tributary of the Thoué, a feeder of the Loire, rises in this department, and has the greater part of its course on the western border. The Charente just crosses the south-western angle.

*Soil and Products.*—The most productive soils are in the north; those in the south and south-east are generally poor. The principal productions are wheat, maize, millet, rye, oats, hemp, flax, sainfoin, lucerne, pease, and potatoes. In general, however, agriculture is in a very backward state. A great number of fine horses, mules, horned cattle, sheep, goats, and pigs are bred, and poultry are abundant. The vineyards occupy a considerable extent of land, and yield white and red wine of ordinary quality. The woods cover above 200,000 acres, and waste and barren lands nearly as much. A large quantity of walnuts, chestnuts (which form an important article of food for the poorer inhabitants), besides various kinds of fruit, are grown. The climate of the department is mild but changeable, and is generally healthy.

Iron is abundant; and there are many quarries for mill-stones, whetstones, lithographic stones (which are finer and harder than those of Munich), limestone, freestone, and marble, which takes a good polish. At La Roche Posay are sulphurous mineral waters. The principal manufacture is that of arms and cutlery at Châtellerault; but the inhabitants are also employed in making coarse woollens, serge, lace, hosiery, cutlery, bleached linen, hemp, leather, and paper. A good trade is carried on in these articles and in the varied products of the soil. The line from Orleans to Bordeaux, with its branches and connections, affords good railway accommodation.

The department is divided into the five arrondissements of Poitiers, Châtellerault, Civray, Loudun, and Montmorillon. The capital of the arrondissement of Poitiers, and of the whole department, is POITIERS.

**VIENNE, HAUTE,** a department in France, formed out of upper Limousin, part of lower Marche, and a few districts of upper Poitou, is bounded N. by Vienne and Indre, E. by Creuse, S. by Corrèze and Dordogne, and W. by Charente. Its greatest length is 60 miles, and its greatest breadth 50. The area is 2130 square miles, and the population in 1886 was 363,182.

*Mountains and Rivers.*—The heights of Gâtine, extending from the great mountain group of Auvergne toward the mouth of the Loire, separate the basin of that river from those of the Garonne and the Charente, and cross the southern part of Haute-Vienne in a direction nearly from east to west. Mont Jargeau, the most elevated point on this chain of hills, is about 3114 feet high. Another range, nearly parallel to these, crosses the centre, separating the valley of the Vienne from that of the Gartempe. The most elevated point here is Le Puy le Vieux, 3196 feet high.

The mountains have generally round peaks; few steep or craggy summits appear. They are highest in the east, and slope gradually to the west. On the top they are almost destitute of vegetation, but as they descend are covered with birch and pine, and ultimately with extensive forests, containing great numbers of chestnut trees. The other parts of the department are for the most part level.

The department is chiefly included in the basin of the Loire, but the southern slopes of the Gâtine heights belong to those of the Charente and the Garonne. Of the tributaries of the Loire the Vienne crosses from east to west into Charente, after receiving several small feeders on both banks. The Gartempe, a tributary of the Creuse, which drains the northern part; the Briance and the Taurion are the names of the other principal streams. Not one of the rivers is navigable. Ponds are numerous, but small. There is good railway accommodation between all the principal towns.

*Climate, Soil, &c.*—Owing to the general elevation of the surface the climate is colder than the latitude would indicate. The average temperature of Limoges is lower than that of Paris, though it is 5 degrees further south. The atmosphere is moist and the weather changeable.

Only a small portion of the soil is fit to grow wheat. A considerable quantity of rye, buckwheat, beans, and pease is raised; the growth of corn is, however, insufficient for the support of the inhabitants, the deficiency being made up by the abundance of chestnuts. Grazing forms the most important branch of agricultural industry. The hay is excellent, but the artificial grasses are not much known. A great number of mules, of horses of the esteemed Limousin breed, and of horned cattle and sheep, are reared. Horse races and a cattle show are held yearly at Limoges, and prizes distributed. Pigs are numerous. The vineyards are not very extensive, but yield a large quantity of indifferent red wine. Hemp is much cultivated. Chestnuts and walnuts are grown in great abundance, and there is a considerable quantity of oak timber. One sixth of the entire area is absolute waste. Game is plentiful, and wolves, foxes, wild boars, and badgers are found in the forests. A great number of bees are kept. Iron, copper, tin, lead, antimony, and coal mines are worked. Porcelain clay, including an excellent seam of kaolin, which is largely employed in the porcelain works in the neighbourhood of Paris, and granular felspar are obtained. Good granite and other building stone and limestone are dug. Iron is the most important manufacture, and there are many blasting furnaces, steel, and other iron works, after which cutlery, coarse cloth, druggets, flannel, blankets, linen, cotton yarn, leather, paper, glass, porcelain, and pottery, are the chief industrial products.

The department is divided into the four arrondissements of Limoges, St. Yrieux, Bellac, and Rochechouart. The capital of the arrondissement of Limoges, and of the whole department, is LIMOGES.

**VIETA,** the Latinized name adopted by François Viette, the founder of modern algebra, who was born at Fontenai-le-Comte, near Rochelle, in 1540, and died about 1603. He appears to have been a member of a legal family, and was master of requests during the reign of Henry III. of France; he afterwards was attached in an official capacity to the household of Marguerite de Valois, the first queen of Henry IV. He rendered important services to the French government by deciphering Spanish diplomatic despatches. The Spanish court, convinced that their cipher was impenetrable to merely human skill, are said to have absurdly accused him of sorcery in a formal complaint to the Pope, but this is somewhat doubtful. He occupied his leisure in the study and advancement of pure mathematics, to which science his services can be paralleled among his contemporaries by those of Napier alone. He introduced for the first time the practice of representing

known as well as unknown quantities by symbols, and thereby founded the science of algebra properly so called. He made a most important step in trigonometry, by his discovery of the relations among the circular functions of multiple arcs. He was the first who extended the arithmetical process of the extraction of roots to the solution of equations of the higher orders. His life was cut short while he was engaged upon a proposal for the reformation of the calendar, for he was a bitter opponent of Clavius the mathematician, to whom Pope Gregory had entrusted the preparation of the Gregorian Calendar, still in use.

**VIGA GANITA** and **LILIWA'TI**, the names of two Hindu works, the first on algebra, the second on arithmetic, written by Bhascari Acharya, in the twelfth century. They are our principal sources of information on Hindu mathematics. These works are the outcome of a long series of mathematicians from before the Christian era, which evidently are the sources of the ancient Greek as well as the mediæval Arabic mathematics. The clearness of the Hindu algebra, even read as it must be by us in most unfamiliar notation, is most admirable, and it reaches to exceedingly abstruse calculations. The astronomer Bailly, when the Viga Ganita was first discovered by Europeans, set its date at many centuries before Christ, and even Sir William Jones places it at 2000 B.C.; but the researches of later scholars prove that those who so fiercely opposed the philosophers named were more nearly in the right, and the date of the Viga Ganita (not that of the earliest Hindu algebra) is now fairly regarded as settled at about 1150 A.D. The best English edition is by Colebrook (1817).

**VIGILIUS**, Pope, a Roman by birth, and of a consular family, was appointed nuncio at Constantinople by Boniface II. When the Empress Theodora (consort of Justinian) wished to depose Pope Silverius, who had incurred her displeasure, Vigilius was intriguing for the dignity. Silverius, who was in command at Rome, in conformity with his instructions from the empress, stripped Silverius of his pontifical robes, and banished him to Patara; or rather his wife Antonina (the empress's favourite) did so in the general's presence, using the careless words, "The Pope Silverius is deposed, and is now a monk." He then ordered the Roman clergy to elect another pope in his place, and suggested Vigilius, whom they chose accordingly in 537. The latter went to Rome, and was there inducted. But his election is looked upon as unlawful till Silverius' death in 538. It is said that Silverius was starved to death by order of Vigilius, and that Theodora was paid a large sum of money for the election of the latter. In 545 he left Rome for Sicily, whence he furnished the capital with provisions while it was besieged by the Goths. He went to Constantinople in 547, at the request of Justinian, and remained there for several years; but having opposed the views of the emperor respecting the three chapters—*i.e.*, certain works of Theodorus, Theodoreto, and Ibas, passed by the Council of Chalcedon and now condemned by special edict of the emperor—he was persecuted until he condemned these writings as president of a council of seventy bishops at Constantinople in 548. But so great was the outcry against him in the Western Church that he hurriedly recanted. The end of it was, that after suffering much personal violence, as well as mental persecution, he was compelled to flee to Chalcedon in 552. In 553 a general council was summoned by Justinian at Chalcedon to decide upon the three chapters. As Vigilius refused to concur in the condemnation of them, he was banished to the island of Proconnesus. He was recalled, however, at the treaty of Nareses, Justinian's general. Vigilius now sanctioned the condemnation of the three chapters decreed by the council, and the emperor allowed him to return to Italy. Altogether he had condemned and sanctioned these writings three times each. On his way to Rome he landed

at Syracuse, where he died in 555, after a reign of sixteen and a half years.

**VIGNETTE**, a small decorative engraving, which has no complete background nor defined boundary, and is used in printing for the illustration of a page of any work. In photography, it designates a portrait which only gives the head and bust of the sitter, and shades off on all sides.

**VIGNOLA, GIACOMO BAROZZI DA**, an eminent Italian architect, was born in 1507 at Vignola in Modena. Some of his measurements and drawings of the principal architectural remains at Rome being seen by Bramante, who was at Rome collecting antiquities for Francis I. of France, he engaged Vignola to take moulds from the principal ancient statues and reliefs, and to accompany him to France to superintend the casting of them in bronze. Vignola also made several designs of buildings for Francis. About 1542 he returned to Italy and worked as an architect at Bologna and Rome. In 1555 he executed his chief work, the Caprarola Palace, a structure in the form of a pentagon, each side 130 feet long, inclosing a circular court 65 feet in diameter. The rooms were splendidly decorated with frescos by Taddeo Zuccheri. The elegant villa of Pope Julius III., near the Flaminian gate, was built a few years before this by Vignola. When Philip II. of Spain proposed to erect the Escorial, he consulted Vignola, and wished to engage his services; but the architect declined the offer on the plea of advanced years. Vignola was appointed architect of St. Peter's on the death of Michelangelo, 1564. He died at Rome on 7th July, 1573. Vignola exercised considerable influence on architecture by his buildings, but much more by his writings. Numberless editions of his treatise on the five orders, "*Regola dei cinque ordini d'Architettura*," have been published down to that of G. Villardi (folio, Milan, 1851); it has been translated into most languages, and is universally referred to as a standard authority. With the writings of his contemporary, Palladio, it served to define the proportions and to fix the applications of the orders, and in so doing, there can be little doubt, to cramp the invention of architects, and check the development of the art.

**VIGNY, ALFRED VICTOR, COUNT DE**, an eminent French novelist and poet, was born at Loches, Touraine, on the 27th of March, 1799. He was sent to a school at Paris, where, however, he so soon became inoculated with the war fervour of his companions (those were the days of Napoleonic triumphs), that his mother deemed it advisable to recall him home. At the age of sixteen, however, he persuaded his parents to obtain him a commission in the king's regiment of musketeers. He attended Louis XVIII. in his flight to Ghent when Napoleon returned from Elba. In 1823 he exchanged into the line that he might see something of active service in Spain; but his regiment was detained in the Pyrenees, and his enforced leisure he devoted to poetical composition. His poems are few but most exquisitely finished, giving foretastes of Hugo, of Lamartine, and of De Musset, in turn. The new passion absorbed him so thoroughly that in 1828 he quitted the army, and gave himself up entirely to literary pursuits. It seems remarkable that after 1829 he ceased to write in verse. In 1826 he married a wealthy English lady, and it was in this year that he published his admirable romance of "*Cinq Mars*," which is almost as well known in England as in France. In the year 1832 he produced "*Stello, or the Blue Devils*," and in 1835, the novel of "*Military Servitude and Greatness*." His play of "*Chatterton*," founded on an episode of Stello, was also exceedingly successful. In 1845 he became a member of the Institute. He died at Paris, 17th September, 1863. He was a great lover of Shakespeare, and translated some of his plays into French, the best being "*Macbeth*" and "*Othello*." An edition of his complete works, in eight vols., was published in Paris (1863-66).

**VIHUE'LA**, the Spanish mediæval viol of the twelfth century, was a sort of rebeck but with a broader body, and possessing *échancures*, the incurvations of contrary flexure which permit the passage of the bow, and which, in their finished form, give so remarkable a figure to the outline of our violins. The sound-holes of the vihuela also differ, both in shape and in position, from those of the more northerly viols. The *vihuela de arce* had usually four strings, but occasionally five. A remarkable band of performers on the vihuela, interspersed with a few harpists, &c., occurs as a tympanum over the door of the Portico della Gloria of the Church of St. Jago da Compostella, built in the twelfth century, and the instruments are most accurately shown. Another form of the instrument, called the *vihuela de penola*, was strung with wire strings and struck with a quill, or played with the fingers guitar-fashion. This is why guitars, in the time of Henry VIII., are often spoken of as "Spanish viols."

**VI'KINGS**, the Danish and Scandinavian pirates or sea-rovers, who held the coasts of England and France in awe from the eighth to the tenth century. The word is properly *rikingr*, from *rik*, a fiord or inlet of the sea; and *ingr*, "sons of"—i.e., "sons of the bay"—those who haunted the fiords where they and their keels could lie concealed, or if need be, easily defend themselves when attacked. The word has no relation to king, and by good right should be pronounced *rik'ing*.

**VILANELLE, VILLANESQUE**, antique forms of French poetry, the second being a more modern and easier variety of the first. The peculiarity of the villanelle is that it is in three-line stanzas or triplets, and alternates are of two refrain lines at the end of each stanza, as in the famous specimen, so often quoted as a type, by Passerat (1531 1602):—

- (a) J'ai perdu ma tourterelle,  
Est-ce point celle que j'ay?
- (b) Je veux aller apres elle,  
Tu regrettes ta femelle,  
Hélas! aussi fais-je, moi.
- (c) J'ai perdu ma tourterelle, &c.

Both refrains are stated in the first stanza, and then alternate in successive stanzas; both being again stated, but giving a different sense, in the last stanza.

Swinburne, in our day, has raised one of these old French artificials of verse-making to a medium of genuine artistic power. See **ROUNDEL**.

**VIL'AYET**, the designation of the chief administrative divisions or provinces of the Ottoman Empire, each under the authority of a governor-general (*râli*) and a council. The vilayets are divided into *liras* or *sanjaks*, under governors appointed by the Porte, but receiving their instructions through the governors-general, and these into *cazas* or districts. Some of the Turkish provinces were, until recently, governed by pashas, and hence also called pashalics; but this name has been replaced by the term vilayet, or its equivalent *eyalet* (government), which two terms are used more or less indiscriminately.

**VIL'LA**, the country manor-house and group of farm-buildings of the wealthy Roman senator in the later republic and in the imperial times of Rome. These villas were often of great size, and had a large park and farm attached to them. That of the Emperor Hadrian, which has proved such a storehouse of fine statuary and gems and other works of art, which are from time to time unearthed within its precincts, stood in grounds 7 miles round, whose boundaries we still trace near Tivoli. We can observe the ruins of two theatres and a concert-room, of large dormitories for casual pilgrims and petitioners, and barracks for the guards; and we can still discover remains of those structures, imitative of the most famous buildings, and even some of the landscapes (as the vale of Tempe) which Hadrian had seen on his extensive travels,

and which he had caused to be reproduced in his park; there were a basilica, a temple (with an oracle in the emperor's time), and many other great buildings, besides the villa itself and the several groups of farmhouses and business places. Of course this was an exceptionally large place, but the great villas and parks round Rome which still occupy the place of the urban villas of antiquity, are of very extensive dimensions, and it is of course certain that the country houses were much larger.

The term has now sunk in our day to the signification of a small suburban *cottage orné*, and is rather in disrepute.

**VILLAFRAN'CA**, the scene of the meeting of the emperors of France and Austria after the Italian campaign of 1859, is a town of Italy, in the province of Verona, 9 miles south-west of the town of that name. It was also the seat of war in the campaigns of 1818 and 1866. The town has some manufactures of silk. The population in 1882 was 8693.

**VIL'LAINS**. See **VILLIFINS**.

**VILLANCICO** (Spanish), a sort of madrigal of two or more seven-line stanzas, a favourite form of poetry in the fifteenth century. Like the Italian mediæval musicians with their secular madrigals, the Spanish composers were fond of using a villancico (words and all) as a basis whereupon to erect counterpoints, &c., for church masses—a curious and now almost incredible jumble of sacred and profane ideas, which is still perpetuated by name in the Christmas-eve anthems, called villancicos to this day. It is needless to say that none but sacred words and grave music are employed in the villancicos of to-day.

**VILLARS, LOUIS HECTOR, DUC DE**, a French marshal and one of the most illustrious soldiers of France, was born 8th May, 1653, at Moulins. He studied at the college of Juilly, and afterwards became a page of Louis XIV., who intrusted him with a troop of horse before he had reached the age of twenty. His first campaigns were in Germany, under Turenne, and here the skill and courage he evinced procured him the command of a regiment of cavalry in 1674. From that time until 1678 he served in Alsatia and Flanders, and on the termination of the war he returned to court, being employed diplomatically during the ten years that followed to the satisfaction of Louis, who, unlike his minister Louvois, always favoured Villars. On the breaking out of the war in 1688, Villars was appointed to a cavalry command in Flanders, and the following year he was created marshal, subsequently assisting Joyeuse on the Rhine, until the peace of Ryswick in 1697. As ambassador at the court of Vienna, to which post he was appointed in 1699, and which he held for several years, he displayed a patient diplomatic genius which could scarcely have been expected of one whose impetuous valour in the field had hitherto been the main feature that distinguished him. In 1702 he commenced his successful campaign in Germany, being this time commander-in-chief, and he gained the victories of Friedlingen in 1702 and Höchstadt in 1703. His next achievement was the suppression of a revolt in the Cevennes, a task which he accomplished by the exercise of blended humanity and firmness, thus saving France from the misery of a civil war at the time when she was engaged in hostilities with the greater part of Europe. From 1705 to 1714 his life was spent in ceaseless military labours, and during that period he displayed many of the highest qualities of a general, though he was finally compelled to yield to Marlborough. In 1706 he lost the battle of Ramillies and that of Malplaquet in 1709, and at the latter he was dangerously wounded. The peace of Rastadt in 1714 closed for a time his military career, and throughout the chief part of his after-life he was immersed in the business and intrigues of state. In 1732, on the occurrence of a breach between France and Austria, he was sent to command in

Italy; and during the campaigns of 1733-34 he exhibited, although upwards of eighty, all the fiery vigour that marked his youth. On his way back to France he became ill at Turin, and died 17th June, 1734. His "Mémoires" (the Hague, 1734, 1758) are, with the possible exception of the first volume, the work mainly of the Abbé de la Pausse de Margon. See also Anquetil, "Vie du Maréchal de Villars" (four vols., Paris, 1784).

**VILLARSIA** is a genus of plants belonging to the order GENTIANÆ. The species are aquatic plants, widely distributed over the warmer and temperate parts of the world, and have entire floating leaves and clusters of yellow flowers, which have a five-parted calyx and a wheel- or funnel-shaped five-parted corolla. *Villarsia nymphaeoides*, the only British species, is now generally made the type of a distinct genus, *Limnathemum*. It is very rare in Britain, being only found wild in a few of the southern counties of England, though it has been naturalized in the north of England and in Scotland and Ireland. It is common in Holland and in many parts of Europe, and occurs also in Southern Siberia. It is a beautiful plant, found in still-running streams. The floating leaves resemble those of the common water-lily, but are smaller, and the flowers are large, yellow in colour, with a fringed funnel-shaped corolla. Several of the exotic species are cultivated for the beauty of their flowers.

**VILLEFRANCHE**, a town of France, in the department of Aveyron, on a river of the same name, situated in a fine valley, 30 miles E.S.E. of Cahors. It has some interesting churches, a college, library, and museum, a theatre, and some manufactures of linen and cloth goods, and a trade in truffles and hams. There are copper, tin, and silver mines in the vicinity. The population in 1886 was 9504. The town stands near the site of a Roman station called *Carantanagrus*.

**VILLEFRANCHE**, a town of France, in the department of the Rhone, situated on the Morgon, near the Saone, 17 miles N.W. of Lyons. Its chief buildings are the hotel de ville and the church, and there are some manufactures of cottons and linens. The population in 1886 was 11,773. It was the capital of the old Beaujais.

**VILLEFRANCHE**, a small seaport of France, in the department of the Alpes Maritimes, adjoining Nice on the east. It contains a harbour inclosed by a mole, with slips, barracks, storehouses, &c.; but the change of frontier has diminished its importance. It is situated at the head of an inlet, 2 miles long, which forms a capacious and sheltered harbour of refuge, and which has frequently given accommodation to the French, British, and other naval squadrons. The peninsula of St. Jean, partly inclosing this harbour, from Beaulieu to the lighthouse at its southern extremity, presents very picturesque scenery; the cliffs of reddish sandstone being varied with groves of olive, orange, and lemon trees, and with divers other forms of vegetation. Population, 3200.

**VILLEHARDOUIN, GEOFFROY SIRE DE**, one of the few mediæval barons whose fame is due to his writings. He was born about 1160 in a castle near Bar in Champagne, of which county he was in his thirtieth year the marshal. When Tybalt, count of Champagne and Brie, in 1199 resolved to go on a crusade to Jerusalem, Villehardouin was one of six deputies sent to Venice to prepare for the embarkation of the crusaders. The expedition started in 1202. Geoffroy conducted negotiations with both Isaac and Alexios Komnēnos. After the capture of Constantinople in 1204, Baldwin, the Latin emperor, made Villehardouin marshal of Roumania. The Marquis of Montfort, his first leader to the crusades, estimated his services at the high price of a town and its dependencies in Thessaly, where he gave him Messinopolis. Here the worthy knight died in 1213, leaving a family which con-

tributed various members to the aristocracy of mediæval Greece, and the elder branch of which was not extinct till 1400. The work which has immortalized Villehardouin is a precise, clear, and interesting recital of the events which he witnessed in the East. It is entitled "Du la Conqueste de Constantinoble," and embraces a period of nine years, from 1198 to 1207. It has all the merit which belongs to the concise yet comprehensive narrative of a sincere, chivalric warrior and a prudent counsellor. Many editions and translations have been printed of this work, the original language of which, being the oldest French prose extant, is intelligible with difficulty to the majority of readers. The latest edition appeared at Paris in 1871, edited by Ed. N. de Wailly. We give a specimen sentence, taken at random (siege of Gadres):—"L'endemain de la Saint Martin issirent de cels de Gadres et vinrent parler lo Due de Venise, qui ere en son paveillon, et li distrent que il li rendroient la cité et totes les lor choses suls lor cors en sa merci" (The day after St. Martin, came out some of them of Gadres, and came to speak with the Doge of Venice, who was in his tent, and said [*dirent*] to him that they would yield up to him the city and all their possessions, save their bodies, to his mercy).

**VIL'LEINS** or **VILLAINS** (Low Lat. *villani*), in the feudal ages, were servants or bondmen of base condition, who, like serfs, were the property of the feudal lord (*villains in gross*), or mere appendants to the soil (*villains regardant*). They were so named because they usually dwelt in villages, and were looked upon as little better than mere slaves, whom the lord might at any time deprive of their goods and chattels, and to whom he might even administer personal chastisement. Villenage was a base tenure of land or tenements, according to which the tenant was bound to do all such services as the lord required; but all those who thus held in villenage were not necessarily villeins in the sense of serfs. From this system of villenage copyhold tenures appear to have originated; though the slavery of the custom has been long discontinued. In early England a large part of the people appear to have been in a servile condition, either as domestic slaves or cultivators of the land. These were the *thralls*. The old body of freemen, the *ceorls*, also degenerated till they hardly became distinguishable from the thralls, those of them who had failed to become thegns; and these degraded ceorls formed the bulk of the *villani* of Domesday Book. The Norman Conquest did not materially alter the state of slavery in England. The lands were transferred to Norman masters, and the slaves passed as part of the property.

The labouring ceorl or villain, under the Normans, sank low, but always retained some rights and privileges, as for instance, of becoming free from their lord by residing in a town for a year and a day, &c., which of course would not be the case with thralls or actual slaves. As time went on the customary services of villeins became more clearly defined, and gradually shaped themselves into a labour rent, so many days of labour to be given without charge in the year, and by this labour the lord's own farm was tilled. Except these days the villeins were at this time free to labour as they would, and those who had no farm or no little plot of land of their own served others better off than themselves as hired labourers. Thus the villeins began to amass property, so that even if they had no land at first they became able to buy small portions. The church exerted herself also to ameliorate their condition; and, finally, their readiness to serve in war, and the difficulty of enforcing their return to their serfage when the troops were disbanded, often in some distant town or port, freed many thousand villeins annually.

Therefore the feudal lords found it on all accounts to their interest to commute the services of villeins by a fixed money payment, and to convert villenage tenures into

copyholds, subject to rent or service and the customs of the manor, these tenures being entered on the court roll. At the same time the leasehold system grew up, and portions of the manor were let out to farmers at a yearly rent, as it became increasingly difficult for the lords of the manor to enforce villein-labour or to hire free labourers, and therefore irksome to till their own fawn-lands.

It was a determined attempt to force back the free labourers and copyholders to the old system of villenage, which originated the revolt of Wat Tyler in 1381, in which the peasantry attempted to destroy completely the proof of their former villenage by destroying the court-rolls of the manors. Villenage never existed after this time to any real extent.

In England a few instances of prædial servitude existed till the reign of Elizabeth, and perhaps still later; but by a statute of Charles II. the services of villenage were entirely abolished. In some parts of France it existed down to the revolution of 1789. The term is unknown in Scotland. But in land held by feudal tenure the person from whom the title is held is called the *Superior*, and the party holding the land is termed *vassal*. The former is said to possess the *dominium directum*; and the latter, the *dominium utile*.

**VILLENAGE.** See VILLEINS.

**VILLENEUVE, PIERRE-CHARLES-JEAN-BAPTISTE-SYLVESTRE DE**, Vice-Admiral of France, the scion of an ancient and noble family, was born at Valensole, in the department of Basses-Alpes, 31st December, 1763. He entered the navy in his fifteenth year; was a captain in 1793, and captain of division (or commodore) in 1796. He was present, in command of the rear division of the French fleet, at the battle of the Nile, and succeeded in rescuing from destruction his own ship and four others, which he carried off to Malta. This stroke of good fortune recommended him to the notice of the emperor; in 1804 he was promoted vice-admiral, and in the following year appointed to the command of the Tonlon fleet, with which he made his way to Cadiz, and, joined by a Spanish squadron under Gravina, sailed for the West Indies, where he took numerous prizes. Finding himself pursued by Nelson, he repaired to Europe, but off the Azores was met by Sir Robert Calder, and a fierce contest ensued, in which the honours were carried off by the inferior British force. Villeneuve then bore away for Cadiz, where he was blockaded by Nelson; Napoleon's scheme for the invasion of England being thus completely overthrown, as the blockade rendered it impossible for the French and Spanish to effect a junction with the fleet at Brest and obtain the command of the Channel. By a manoeuvre of Nelson's the admiral was induced to believe the English fleet so diminished in number as to offer a comparatively easy prey, and, anxious to retrieve his credit with the emperor, he quitted Cadiz harbour, and fought the great and decisive battle of Trafalgar. He behaved with heroic courage, and displayed considerable seamanship, but Nelson's genius and English steadfastness overpowered him. His vessel, the *Bucentaure*, was dismantled and forced to strike, and Villeneuve was conveyed as a prisoner of war to England. In the following April he was allowed to return to France, but on his way to Paris he halted at Rennes, until he could ascertain the nature of the reception awaiting him at the French court. Being informed that Napoleon had determined on his disgrace, he committed suicide, and was found dead in his bed, with six knife wounds about the region of the heart, on the morning of the 22nd of April, 1806.

**VIL/LI** (Lat., hair tufts), vascular processes forming a velvety pile and lining the intestines, the absorbent vessels being looped within them.

**VIL/LIERS.** See BUCKINGHAM, DUKE OF.

**VILLON, FRANÇOIS**, the first writer breathing the modern spirit among French poets, had a most remarkable life. We do not know much about his name, save that it was not Villon. He had many aliases, some of them being Corbueil, Corbier, and De Montcorbier, but which, if any, was his real name is quite uncertain. We know also that he was born in Paris in 1431, but do not know when he died. Numerous investigators have worked, with little success, upon his life. The best is Lognon (1877).

Villon began as a student of the University of Paris, got mixed up in a drunken brawl, killed a priest in self-defence, and fled for his life (1455). His friends at court got him a pardon six months later. But no sooner was he in Paris again than he entered into a quarrel over a faithless mistress, and had once more to fly for his life (1456). Next he joined a band of desperadoes, who plunged into Bohemianism for the liberty and adventures it yielded. A burglary committed by them led to Villon's detection, and he was tortured to obtain full confession from him and then condemned to death. He was not put to death, however, but was banished from Paris. After that all we know of him is that in 1460 he was put in prison at Meung by the Bishop of Orleans, and the king, Louis XI., who esteemed his poetical power, set him free.

His work is very small in quantity, but of the most prodigious power. The chief pieces consist of the "Petit Testament" (1456), a mock will, a sort of poem much in vogue at the time, the legacies being honoured by legacies calculated to satirize any known defect or weakness of theirs, and the "Grand Testament" (1460); the first of forty, the second of seventy-three eight-lined stanzas. The "Grand Testament" contains also many episodes in the form of ballades or rondeaux. Besides some smaller pieces, a whole set of which is in thieves' slang there is a piece in the metre of the Testaments called "*Les Repues Franches*" (free commons), a most clever account of the rascally tricks of the vagabond dandies to whom Villon had joined himself. The first edition of his works appeared in 1489, and there have been at least thirty-five since, possibly more, for the little collection has true gems and originality in it. Perhaps the best of all editions is that of the bibliophile Jacob (Paris, 1854).

The wonderful power of rhyming in Villon, the felicity of small touches, the pathos, and even tragic intensity which he indicates in that rapid way of his, give never-ending pleasure to the readers of the lines of this thieving, brawling vagabond. Perhaps Villon overstates his misdeeds, for artistic purposes, it may be; at all events he is, on his own showing, a very choice rascal. But no thoughtful man can read the ballad of the "*Belle Heaulmière*" (who, as a wrinkled old crone, recounts the former splendours of her vanished beauty) without a pang of regret at the decay which has been ordered to seize upon all beauty, and destroy it after too brief a life; and we pity the poor creature none the less for her being frankly regretful as much of the lost power of sinning as of the lost beauty. Then also the appeal to Death, who has robbed him of his mistress, is superb, especially the line

"Deux estions et n'avions qu'un cœur."

which is the quintessence of a love-romance. When he and his companions were lying in prison, tortured and in hourly expectation of death, Villon wrote an epitaph on them, appealing to the passers-by—"human brothers"—to take pity on the five or six corpses swinging on the gallows. It is truly a weird fancy and of immense force. One stanza runs thus:—

"La pluie nous a debuez et lavez,  
Et le soleil desséchez et noirciz;  
Mes corbeaux, nous ait les yeux cavez  
Et arrachez les barbes et les sourcilz.  
Jamais, un temps, nous ne sommes rascals,

Puis çà, puis là, comme la vent varie  
A son plaisir, sans cesse, nous chario  
Plus bequenez d'oyseaulx, que dez à coudre.  
Hommes, icy n'usez de moquerie,  
Mais priez dieu, que tous nous venillo absoudre!"

**VILLOSE** (Lat. *villus*, animals' long hair), in botany and zoology, is a term applied to any part which is thickly covered with soft flexible hairs.

**VIL'NA** or **VILNO**, a town of Russia, the capital of a government of the same name, is situated on both sides of the Vilia, 43 miles S.S.W. of St. Petersburg by rail. It is built on several heights overlooking the river, is walled and chiefly constructed of wood. It has a cathedral, several other churches, a synagogue, mosque, and several educational establishments. The ancient university was abolished in 1832. There are a theatre, two palaces, and a museum. Christianity was introduced here by Jagellon in 1387, and the cathedral contains the tomb of St. Casimir. The population in 1883 was 93,763.

**VIMIE'RO**, a town of Portugal, in the province of Estremadura, and near the coast, 7 miles north of Torres Vedras, famous for the defeat of the French by the Duke of Wellington, 21st August, 1808.

**VINA**, the name of the principal national instrument of the Hindus, said to have been invented by the god Nareda. It is of the very highest antiquity, and is alluded to in the Vedas themselves. It has seven thin wire strings and numerous frets, which, to accommodate the instrument to the large number of differing Hindu scales, are movable, being fixed in the desired positions by wax. Two hollowed gourds, cut open at the bottom by circular holes 5 inches in diameter, are attached to it to increase its sonority. Most commonly it has for body a black wooden bar about 3½ feet long, and has nineteen brass frets. Only four of the strings run over the finger-board, these being of brass. Another string of brass and two strings of steel pass beside the finger-board, and therefore form a sort of drone. The two fingers which pluck the stopped strings are armed with plectra, attached to rings slipped on the finger tips like flimbs; the other fingers touch the drones. The fingering is by the left hand. In playing, the instrument is held obliquely, one gourd resting on the left shoulder, the other under the right arm. Indians themselves, and even Anglo-Indians, are enthusiastic over the tone of the vina, which so accurate an observer as Colonel Meadows Taylor says is in native hands an instrument of much power and sweetness.

**VIN'CA**. See PERIWINKLE.

**VINCENNES**, a fortified town of France, in the department of Seine, 5 miles distant from the Louvre, Paris, at the entrance of the Bois de Vincennes. Its walled park is intersected by a great number of beautiful avenues, much frequented in fine weather by the Parisians. But the most attractive object here is a castle, formerly the residence of the French kings, with its vast girding walls, wide ditches, square towers, and massive keep, often used as a state prison. This building was erected in 1339, in the midst of the forest, and it was a royal residence till the time of Louis XV. The great Condé, Diderot, Mirabeau, and many other distinguished persons, were confined in the fortress, outside of which the Duc d'Enghien was shot by order of Napoleon I. on the 21st March, 1804. His tomb is in the interior. The castle, which is a fortress of the first class, contains a beautiful chapel, founded in 1379, a fine armoury, and a depot and school of artillery. The population in 1886 was 18,531.

**VIN'CENT DE PAUL, ST.**, an illustrious philanthropist, was born in the parish of Pouy, in Guienne, 24th April, 1576. Till his twelfth year he assisted his parents in the care of their little farm, but by this time his thoughtfulness and piety had become so manifest that he was sent to a neighbouring convent of the Cordeliers to be

educated for the priesthood. He took the tonsure in 1596, was ordained a priest in 1600, and in 1604 obtained the degree of *bachelier ès lettres*, with license to lecture. The same year he was captured by Tunisian pirates while on a voyage from Narbonne to Marseilles, and was carried to Tunis, where he endured three years of slavery. The last of three masters, a renegade Savoyard, was so affected by his piety that he returned to the Christian faith, and with Vincent escaped from Tunis in a small boat, in which they succeeded in reaching the shores of France. Vincent proceeded to Avignon to represent the sufferings of the European slaves in Africa, and shortly afterwards he was sent to Paris as the bearer of an important despatch to the French king. He devoted himself to the service of the sick at the Hôpital de la Charité; but being unjustly charged with theft, he remained under a cloud, his resignation and patience being greatly tried, for six years, at the end of which the real criminal was discovered. In 1613 he entered the family of the Count de Joigny, general of the galleys of France, to take charge of the education of his three sons, two of whom, the Duc de Retz and the Cardinal de Retz, were destined to play a conspicuous part in French history; and in this service he continued till 1621, being encouraged both by the count and the countess to connect with it a series of eminently successful missions of religion and philanthropy. In the course of one of these missions he was deeply impressed by the degradation and misery of the galley slaves, and at once set about the apparently hopeless task of ameliorating their moral and temporal condition. The difficulties in his way were enormous, but his self-devotion and humility after a time prevailed, and he acquired a wonderful influence over the criminals who were the objects of his mission. One remarkable incident of this portion of his career was his procuring the release of one of the slaves by taking his place at the oar for eighteen months. On his release he was appointed by Louis XIII. to the important office of almoner-general of the galleys of France. In 1624 he founded at Chartres a new religious association, under the name of the "Congregation of the Missions," the object of which was to train up efficient preachers for the provinces of France, the association being approved by a bull of Pope Urban VIII. in 1631. In 1632 he accepted the charge of the house and property of the priory of St. Lazarus, and he lived to see the influence of this small order spread into several of the other Roman Catholic countries of Europe. But of all his numerous foundations for the relief of human misery by far the most important and lasting in its influence was that of the Sisters of Charity, who specially devoted themselves to the care of the sick—an institution which has since become universal in Roman Catholic countries, and has given rise to numerous Protestant sisterhoods of a somewhat similar character. Closely connected with this work was that of the foundation of hospitals for the reception of the sick poor, several of which still exist in Paris, and also of hospitals for the reception of foundlings, for the establishment and maintenance of which he put forth some of his greatest efforts of zeal and sacred eloquence. He was appointed extraordinary confessor to Louis XIII. on his death-bed, and after the death of that monarch he was made head of the Conseil de Conscience, the period of his rule being looked back upon as the golden age of ecclesiastical preferment in France. He died at St. Lazare on 27th September, 1660. He was beatified in 1729, and canonized in 1739, when his festival was appointed for the 19th of July. His writings were few, for he was a man of deeds more than of words, but he left a considerable number of letters, chiefly on spiritual subjects. See Ansart's "Life of St. Vincent de Paul" (New York, 1868), and another edited by Canon Wilson (London, 1873).

**VIN'CENT, ST.**, one of the islands of the Columbian Archipelago, situated between 13° 10' and 13° 25' N. lat.



and 61° 10' and 61° 20' W. lon., having Barbadoes on the east, Grenada on the south, and St. Lucia on the north. It is about 100 miles from the first, and 28 from the last-named island. St. Vincent is one of the most beautiful of the Caribbee group, of an oval form, 18 miles long by 11 broad. The Grenadines consist of several small islets off the southern extremity of the coast. A ridge of high volcanic hills, bold and abrupt, but well wooded, stretches through the island from north to south, and sends off subordinate masses, which extend to the sea, and are intersected by beautiful and fertile valleys, the soil of which is unusually rich. The loftiest summit of the range is Soufrière, which is 3000 feet high, with a crater half a mile in diameter, from whose centre rises a conical hill 300 feet high, and 200 feet in diameter at the base. After a repose of nearly a century an eruption of the mountain took place in 1812. The island has several times suffered from hurricanes and slight shocks of earthquake, especially in 1831 and 1886, when great destruction was caused, but it is one of the healthiest of the archipelago, although the climate is hot and humid, there being an annual rainfall of no less than 80 inches.

The principal products are sugar, rum, molasses, cocoa, cotton and arrow-root. The annual value of the exports averages about £170,000, nine-tenths being to the United Kingdom. The annual imports, consisting chiefly of cotton, linen, and woollen goods, hardware, and casks, are valued at about £150,000, by far the largest part of which is received either from the United Kingdom, or from the other British West India Islands.

The legislature consists of the governor and such other persons as he may appoint, but not less than three. The revenue and expenditure are each about £35,000 per annum. There is no public debt. The population of St. Vincent in 1881 was 40,518, of whom 2693 were whites. Morality is at a very low ebb in St. Vincent—not less than between 50 and 60 per cent. of the births being illegitimate. Kingston, the capital of the island, is on the south-west coast. The town is regularly built, and has several substantial public edifices, comprising a large church, chapels, government house, and court-house. There is also a botanic garden.

St. Vincent was discovered by Columbus in 1498, at which time the natives were numerous, and they continued to be so for a long period afterwards. In 1672 Charles II. placed it, with Barbadoes and some other islands, under one government. The possession of the island was afterwards a matter of dispute with the French, but it was at length yielded to the British by the peace of 1783.

**VINCETOXICUM** is a genus of plants belonging to the order ASCLEPIADEÆ. The species are perennial herbs, or undershrubs, and are chiefly natives of Central and Western Asia, though a few are European. The root of *Vincetoxicum officinale* (swallow-wort), a European species, was formerly much esteemed as an antidote to poisons. It has an unpleasant odour when fresh, and a pungent sour taste. It possesses purgative and emetic properties, and was formerly esteemed a powerful remedy in scrofulous and cutaneous diseases.

**VIN'CI, LIONARDO DA**, was born at Vinci, near Empoli, in the valley of the Arno, below Florence, in 1452. He was the natural son of a notary, Pietro da Vinci, who placed Lionardo, when a boy, with Andrea Verrocchio to learn painting. Lionardo early evinced great versatility: he was painter, sculptor, engineer, architect, and mechanic, and was well versed in anatomy, botany, mathematics, music, and astronomy. He was also a remarkably beautiful man. He does not appear to have ever confined himself to painting as a profession. He seems to have found no field for his labours in Florence; but about, or soon after, the year 1480, he sought and acquired service with Ludo-

vico Sforza, called Il Moro, in Milan. A remarkable letter, written by Lionardo to that prince, is still preserved. He mentions in it all his various qualifications; but alludes somewhat pointedly to his powers as a painter. "I will," he says, "also undertake any work in sculpture, in marble, in bronze, or in terra-cotta; likewise in painting I can do what can be done as well as any man, be he who he may." Ludovico Il Moro took him into his service at a salary of five hundred crowns per annum, and in 1485 established an art academy in Milan under his direction. He educated several distinguished artists at Milan, and produced also himself some few noble works in sculpture and in painting. In his great picture of the "Cenacolo," or Last Supper, in the refectory of the convent of Santa Maria delle Grazie at Milan, he displays a largeness of manner quite unknown at that time. Both Luca Signorelli and Michelangelo were by many years later in developing the great cinquecento style of art, which now gives glory to their names, than Lionardo da Vinci, though both in some respects eventually surpassed him; but Lionardo was the true pioneer of the cinquecento design, in his great work at Milan—which, however, through its being painted in oil or some such method, on a damp wall, soon fell into decay, and an adequate notion of its grandeur can now be formed only from the sketches of single heads, &c., fortunately preserved, or from the fine copy of it by Marco d'Oggione, in the collection of the Royal Academy of Arts in London. Lionardo was also the first painter to fully develop and master the mysteries of chiaroscuro. The "Cenacolo" was finished about 1497; in 1491-93 Lionardo had made for the Duke Ludovico a complete mould for an equestrian statue of his father, Francesco Sforza, but that was shortly afterwards destroyed by the French. He left Milan in 1499, and returned to Florence; there about 1503, the Gonfaloniere Soderini commissioned him to paint one end of the council-hall of the Palazzo Vecchio, the other being intrusted to Michelangelo. Lionardo prepared a cartoon of the "Battle of Anghiari," but only a small portion was painted, now well known from the sketch by Rubens as the "Battle of the Standard." In 1507-9 Lionardo was again in Milan, and it was at this period that Louis XII. of France appointed him his painter. He appears to have lived occasionally at Florence and at Milan; but in September, 1511, he went with Giuliano de' Medici to Rome, where Leo X. gave him some work in the Vatican; but a want of courtesy in the Pope, and a disagreement with Michelangelo, caused him very soon to leave Rome in disgust, and return to the north. At Pavia he was presented to Francis I. of France, who thoroughly appreciating his great abilities, took him into his service, with a salary of seven hundred crowns a year. He accompanied the king to France in 1517, and there spent the short remainder of his life, working but little, his laborious career having apparently rendered him somewhat prematurely old. He died at Cloux, near Amboise, on the 2nd of May, 1519, aged about sixty-seven. Vasari has reported that Lionardo da Vinci died in the arms of Francis I.; but the king was on the 2nd of May at St. Germain, and no journey was performed on that day, so that this pretty story seems more than doubtful. Lionardo was unmarried. Among his many scholars, the most distinguished are Bernardino Luini, Andrea Salaino, and Marco d'Oggione; and among his imitators, Gaudenzio Ferrari is perhaps the most eminent. Authentic works of this great painter are exceedingly rare, the majority of those attributed to him being most probably school pictures only. Among some genuine works may be mentioned his own portrait, a head of Medusa, and an "Adoration of the Kings," at Florence, in the Uffizi Gallery; "La Monica," in the Pitti Palace; "Ludovico Il Moro," in the Ambrosian Library at Milan; "La Vierge aux Roches," in the National Gallery, a replica of which is in the Louvre; a cartoon of St. Anne, in the

Royal Academy, London; "Monna Lisa," "Holy Family with St. Anne," "Vierge aux Rochers," "St. John the Baptist," and "La belle Féronnière," in the Louvre at Paris; and three volumes of anatomical drawings in the royal library at Windsor. All these works are minutely executed, and remarkable for their effect of chiaroscuro; but Leonardo never achieved great excellence in colouring. He was, however, in every sense an extraordinary man: his writings are as remarkable as his paintings. His treatise on painting, "Trattato della Pittura," translated into many languages, is well known, but there are many unpublished works by him quite unknown. Mr. Hallam, in his "Literature of Europe," says of him: "If any doubt could be harboured, not as to the right of Leonardo da Vinci to stand as the first name of the fifteenth century, which is beyond all doubt, but as to his originality in so many discoveries, which probably no one man, especially in such circumstances, has ever made, it must be on an hypothesis, not very untenable, that some parts of physical science had already attained a height which mere books do not record." Though Leonardo's anatomical studies at Windsor can be of no use to artists, they well define some portions of the human body, supposed in the history of anatomy not to have been known, even to anatomists, till a century later than their date, about 1490.

**VINDHYA**, a great series of mountain ranges separating the Gangetic basin from the Deccan, and forming a well-marked, although not quite continuous, chain across India. The name was formerly used in an indefinite manner to include the Satpura Hills, south of the Nerbada; and indeed certain of the Sanskrit "Puranas" apply it specially to the Satpuras. The Vindhya are now restricted to the ranges on the north of that river. Popularly speaking, the Vindhya ranges may be taken as forming the great northern wall of the triangle, whose eastern and western sides, the Ghats, run down either coast of India to an apex near Cape Comorin. The Vindhyas run eastwards from Guzerat across Malwa and the central portions of India, until their easternmost spurs abut on the valley of the Ganges at Raghmahal. The vast hill country, strictly included within this series of chains, lies between 22° 25' and 24° 30' N. lat., and between 73° 31' and 80° 45' E. lon. Its elevation is from 1500 to 4500 feet in height, and nowhere exceeds 5000 feet. These ranges long formed an ethnical and political barrier between the Gangetic valley and the Deccan, and occupied a prominent position in the invasions and administrative arrangements of the Mogul emperors.

The Vindhya occupy a considerable place in the mythology of India as the great demarcating line between the Madhya desha, or "middle land" of the Sanskrit invaders, and the non-Aryan Deccan. They are still inhabited to a large extent by aboriginal races, and the name Vindhya in Sanskrit means also "a hunter." The Vindhyas are personified in Sanskrit literature, and appear as a jealous monarch, the rival of King Himalaya, who called upon the sun to revolve round his throne as he did around the peak Meru. When the sun refused, the mountain began to raise its head to obstruct that luminary, and to tower above Himalaya and Meru. The gods invoked the aid of Agastya, the spiritual guide of Vindhya. This sage called upon the Vindhya Mountain to bow down before him, and afford him an easy passage to and from the south. It obeyed, and Agastya passed over. But he never returned, and so the mountain remains in its humbled condition, far inferior to the Himalaya, till this day.

**VINE** (*Vitis*) is a genus of plants, the type of the order *VITACEÆ*. The species are tolerably numerous, natives of tropical and temperate Asia, tropical Africa, and North America. They are climbing shrubs, furnished with tendrils, which represent lateral flowering shoots, and have usually simple, alternate, stipulate, lobed or serrated

leaves, and small, greenish-yellow, sometimes dioecious flowers in panicles. The calyx is five-toothed; the petals are five, deciduous, distinct at the base, but cohering at the top to form a kind of hood; the stamens are five; the ovary is two-celled, with two ovules in each cell; the fruit is a four-seeded berry.

The most important species is the Common or Grape Vine (*Vitis vinifera*), which is one of the most extensively cultivated and useful of plants. It has large, lobed, sinuately toothed, more or less downy leaves, and small, greenish-yellow, fragrant flowers. The fruit is a round or oval berry, varying greatly in size. The outer skin, which is astringent and indigestible, is green, yellow, reddish, or purplish. The seeds are sometimes aborted, as in the sultana raisins from the Levant, and the currants from the Ionian Islands.

The grape vine has been in cultivation for such a long period that considerable doubt exists as to the countries in which it is indigenous. In the southern part of the Caucasus range and on the southern shores of the Caspian Sea it grows spontaneously, and this region appears to be its original home. Its cultivation extends back to prehistoric times, and arose independently apparently among the Aryan and Semitic peoples. It is now thoroughly naturalized in India and many parts of temperate Western Asia, in the south of Europe, and in Algeria and Morocco. The cultivation of the vine was well known in Greece in the heroic age, and is said to have been brought to the south of France in B.C. 600, when the Ionian Phœceans founded Marseilles. From Greece it passed into Sicily and Italy. The Romans introduced the vine into Germany, and later into Britain. At the time of the Norman Conquest vineyards were in existence in many parts of the south of England, and the cultivation of the vine was practised to some extent by the monks throughout the middle ages. Though the vine is still cultivated and ripens its fruit in England, our climate is not suitable for the production of wine as there is not sufficient continued summer-heat.

The grape is one of the most useful of fruits. In the fresh state it is largely eaten as food in some countries; the pulp has an agreeably sweet acid flavour, and is nutritious and gently laxative. Dried grapes, under the name of raisins and currants, form an important article of commerce, and are used as food in most parts of the civilized world. Currants are the small dried seedless fruits of a variety cultivated in the Morea and the Ionian Islands; the name is a corruption of Corinth, the port from which they were chiefly imported. [See RAISINS and CURRANTS.] The chief value of the grape, however, is for the production of WINE, a liquid obtained by the expression and fermentation of the juices. VINEGAR is also produced to a large extent by the acetous fermentation of the juice. BRANDY, an alcoholic liquor, is obtained by distillation from the fermented juice. The TARTARIC ACID of commerce is also manufactured from a substance obtained in the process of fermentation.

The cultivation of the vine for the production of wine extends from 50° N. lat. to 30° S. lat. The point of the greatest importance in the ripening of the fruit is the length of the summer. Hence, though England has as high a mean temperature as many parts of the world where the vine flourishes in the greatest perfection, the comparative coldness of September and October in our climate prevents the grapes ripening properly. The vine will bear any degree of heat, and is cultivated in some districts quite close to the equator, but a very moist climate is injurious. It thrives in almost any open dry soil, and many of the best vineyards are situated on the slopes of hills where the soil is shallow. In Europe the cultivation of the vine extends as far north as the valley of the Ahr, a river which runs into the Rhine between Bonn and Coblenz. The finest Rhine wines are produced



in the Rheingau, a district near Mayence, where are some of the most famous vineyards in the world, as Johannisberg, Steinberg, and Rudesheim. The vineyards of the south of France, Italy, Sicily, Spain, and Portugal also produce excellent wine. From the two latter countries the cultivation was introduced into the Azores, Madeira, and the Canary Islands and America. In parts of South America, as Chili, Buenos Ayres, and Brazil, wine and brandy are produced. In North America good wines are made from the cultivated species, and also from several native species of vines. The vines of the Cape Colony, where they were introduced by the Dutch, have a high reputation. In Australia the cultivation of the vine is extending, and Australian wines are exported in considerable quantities to Europe.

North America has four species of grape-vines, from which good wine is produced by cultivation. The Wild Vine or Northern Fox Grape (*Vitis labrusca*) has heart-shaped leaves, rather three-lobed, acutely toothed beneath. It is found from Canada to Georgia. There are several varieties with red, white, or black fruit. The wild grapes have a strong musky flavour and a tough sliny pulp, but are much improved by cultivation, and make a pleasant wine. The Summer Grape (*Vitis oestivalis*) has broadly heart-shaped leaves, with from three to five lobes. The grapes are small, deep blue in colour, and of an agreeable flavour. The Frost or Chicken Grape (*Vitis cordifolia*) has small blackish grapes, which are disagreeably acid. The Muscadine or Southern Fox Grape (*Vitis vulpina*) has deep blue grapes, covered with a thick leathery skin. All these species have been introduced into this country as ornamental shrubs.

With its extensive cultivation it is not surprising that a great number of varieties should be described. The vineyards of the Continent and the forcing-houses of England give a list of many hundreds. In most of them the principal difference consists in the form and colour of the fruit, and the shape and clothing of the leaves.

Although our climate does not permit of the grape attaining its greatest perfection in the open air, yet in the forcing system of cultivating grapes by heat Great Britain probably produces the most delicious in the world. But even in the open air in the southern counties of England, if proper care is taken, very good fruit may be obtained; and although not so delicious for eating as that produced by forcing, yet in all seasons a very eatable fruit may be obtained, and in warm dry seasons a very delicious one. In forcing the vine in this country the directions given by the best authorities, from the result of long experience, agree with the natural condition of the plant in respect to climate. Some variation is necessary according to the season at which the forcing is commenced, which is sometimes in the depth of winter, and certain varieties require a stronger heat than others. In giving air the temperature of the house should never be lowered in consequence. The air of the house should be kept moist, except when the fruit is ripening. The syringe may be used for the branches and leaves from the commencement of forcing till the fruit begins to colour, excepting while it is in bloom. Recourse should also be had to steaming, and this more especially when the fruit is setting.

In the formation of the vine-borders all agree that they should be effectually drained. A good bed of stony materials should then be laid all over previous to the soil being placed upon it, which should consist chiefly of rich fresh or maiden loam (strong, yet friable, so as to be at all times pervious to water), a portion of rotten dung, well prepared vegetable mould, to which may be added some lime or other calcareous substance, such as shell-marl, old lime rubbish, or broken bones.

The propagation of vines is easily effected by cuttings, layers, and grafting. Where bottom heat can be com-

manded, cuttings consisting each of only a single eye are to be preferred. These are at first to be placed in very small pots, and successively shifted into larger as their roots require it. They are planted out in the border during spring, sometimes as late as June.

The pruning of the vine should be performed as soon as the wood is perfectly matured in autumn, if early forcing is intended; and in all cases, on walls or elsewhere, the operation should not be delayed later than the beginning of winter. Various methods are adopted in pruning, but the vine may be trained in any fashion, provided that the bearing wood is at regular distances, and not anywhere crowded.

The berries should be thinned as soon as they are formed of the size of small pease; and in doing so the interior ones should be cut out. If a small portion of the lower extremity of the bunch be cut off at this period the part left will have finer and better-swelled berries. The famous vine at Hampton Court Palace, a fine specimen of the black Hamburg variety, was planted in 1769, and still continues to produce excellent grapes to a weight of about a ton annually.

Vines are subject to the attacks of some species of fungi. The Vine-mildew (*Oidium Tuckeri*) makes its appearance as a whitish mycelium on the upper surface of the leaves, which extends to the shoots and then to the grapes. This parasite was first observed in England in 1815, and shortly afterwards appeared in the vineyards of the Continent, whence its ravages extended to almost all vine-growing countries in the Old World. Flowers of sulphur applied by means of a special kind of bellows has been found a good remedy to check the spread of this pest. [See OIDIUM.] More recently the vineyards of France and the south of Europe were devastated by the *Phylloxera vastatrix*, a species of Plant-lice (Aphidæ), the larva of which attacks the roots. The most effective remedies have been found to be sulphide of carbon and sulphocarbonate of potash. See PHYLLOXERA.

**VINEA** (literally, a trellised vine), one of the ancient siege-machines, a sort of hide covered shield or roof to ward off fire, molten metal, and javelins, when approaching the walls of a town for an assault. The roof was held up by poles, carried by soldiers; or when it was large and heavy, was rolled along on wheels.

**VINEGAR**, a dilute acetic acid obtained by the vinous fermentation. [See ACETIC ACID; FERMENTATION.] In countries which produce wine, vinegar is obtained from its acetous fermentation, but in this country it is usually procured from malt, and the process employed resembles the first stages of the brewer's operations. [See BEER.] The malt is ground and mashed with hot water. The wort, after being cooled, is transferred to the fermenting tun, where, by the addition of yeast, it undergoes the acetous fermentation; and when this is over the fermented wort is caused to trickle slowly down through a mass of beech shavings steeped in vinegar, and contained in a vessel, called a vinegar generator or graduation vessel, being at the same time freely exposed to the action of a current of air. The wort requires to be passed three or four times through the vessel before acidification is complete, which is in general effected in from twenty-four to thirty-six hours.

Wine vinegar is made on a large scale at Orleans in France, and wines which are unfit for drinking are sent here from all parts of the country to be converted into vinegar. In the manufactories a great number of casks are set on end in a large room, where the temperature is maintained at about 86° Fahr. The upper head of each cask is perforated with several holes, about 2 inches in diameter, for the admission of the air, and is placed a few inches below the edge, so that the wine may be turned in. A few gallons of boiling vinegar are first turned into the cask, and in a week or eight days about one-tenth as much sour

wine is added, and this process of addition is repeated every seven or eight days until the cask is full. In a fortnight or three weeks the vinegar is ready for the market. In France, and also in other countries, vinegar is made by mixing wine lees with sour wine in perforated casks, sometimes placing the mixture in coarse sacks, drawing off the liquor and subjecting it to further acetification in other casks perforated at the top; these are exposed to the heat of the sun in summer, and to that of the stove in winter.

Wine vinegar is of two kinds, white or red, according as it is prepared from white or red wine. It contains beside acetic acid and water, some ethyl acetate, a little aldehyde, and also some salts, principally bitartrate of potash. Its specific gravity varies from 1.011 to 1.022. The malt vinegar made in Great Britain is of four different strengths, distinguished as Nos. 18, 20, 22, and 24. The last is the strongest, containing 5 per cent. of real acetic acid. Its specific gravity is 1.019, and it is called proof vinegar. Vinegar is liable to putrefactive fermentation, and this, it was thought, might be prevented by the addition of sulphuric acid, on account of which vinegar makers are permitted by English law to add one-thousandth of sulphuric acid by weight. There is good reason for believing that this is unnecessary, but the practice is still continued. In the United States vinegar is usually made from cider, and when this is made from sweet apples, and is of good strength, the vinegar is often preferred to all other kinds. The cider is exposed in barrels with their bung-holes open to the action of the sun in summer, or it is kept in a warm cellar in winter. Cider vinegar usually contains, besides ethyl acetate and other ethers, more or less malic acid.

When vinegar is subjected to distillation it is deprived of its colouring and other non-volatile matters, and is known in commerce as distilled vinegar, which is always weaker than the vinegar from which it is obtained, because the boiling point of strong acetic acid is higher than that of water. Wood vinegar, a product of the destructive distillation of wood, is used chiefly in connection with chemical operations, but though it is deficient in flavour it is often employed for pickling or is sold as table vinegar.

The use of vinegar in the manufacture of pickles, the preparation of salads, and of acid beverages, as well as directly as a sauce with food, is very extensive, and it is the chief ingredient of most of the sauces prepared for table use. It is sometimes said to be taken in excessive quantities by young ladies who have a tendency towards corpulency, but its use in this way is always pernicious, and is sometimes dangerous. Taken in small quantities it is a valuable aid to the digestion of the hard fibrous and albuminous constituents of food. In medicine vinegar is used as a solvent for some substances, which yield their properties to it more readily than to alcohol. It also forms an important addition to astringent gargles, and mixed with water it is used to check bleeding from the nose, womb, and bowels. Vinegar and water forms also a useful cooling lotion in cases of fever, headache, &c. Aromatic vinegar consists of glacial acetic acid, in combination with certain powerful perfumes, and is used on account of its pungent and stimulating properties in cases of faintness, &c. For this purpose it is generally dropped on a small piece of sponge placed in a peppered bottle or vinaigrette. It is highly corrosive, and should therefore be kept from contact with the skin and clothes.

**VINER, CHARLES**, died 5th June, 1756, at his house, Alton, Hampshire. When or where he was born has not been recorded. He was the compiler of a "General and Complete Abridgment of Law and Equity," twenty-four vols., folio, 1741-51. This stupendous work was reprinted in twenty-four vols., 1792-94, and was followed by six supplemental volumes 1796-1806.

He was also the founder of the Vinerian professorship of common law in the University of Oxford, for which

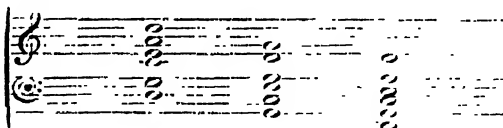
purpose he bequeathed by his will, dated 29th December, 1755, about £12,000 to the chancellor, master, and scholars of the University of Oxford, to establish a professorship, and to endow such fellowships and scholarships of common law in that university as the produce of his legacy might be thought capable of supporting.

**VIOL**, the fiddle of the first three centuries of the modern period, succeeding the rebeck, the geige, and the vielle of mediæval England, Germany, and France, and preceding the violin of Italy. The period of the viols covers from the fifteenth to the eighteenth century. A sketch of a viol is given in the article VIOLIN. The main features of the discant viol, as distinct from the violin, were its flat back, the upper quarter of which sloped towards the belly, so as to lessen the thickness of the instrument where the neck joins the body, the curving shoulders, the differently shaped bouts and sound-holes, the solid bridge, the carved head, and the varying number of strings. The belly and back were much thinner than in the violin. Internally the back of the viol was strengthened by cross-bars and one long bar, upon which the sound-post stood, as well as the usual six blocks of the violin.

Viols were made in sets or "chests." A chest of viols usually contained at least four—a discant viol, two tenor viols, and a bass viol, the last being called *VIOLA DA BRACCIO* and *VIOLA DA GAMBA* respectively. For viols with sympathetic strings, see *VIOLA D'AMORE*.

The tone of the viol was sweet and penetrating, and its mode of stringing made it very flexible and rich in effects, as it was easier to play in simple keys, and also afforded great facility for the performance of arpeggios, or moving harmonies. When the violin first took the place of the discant viol, lovers of the old viol tone protested loudly against the interloper. Thus Thomas Mace, in "Musik's Monument" (1676), inveighs against the noisy violin as drowning the feeble viols and throwing the quartet out of balance; "or suppose a theorbue lute (for bass), the disproportion is still the same. The scoulding violins will outtop them all."

The stringing of the six-stringed viol, the chief variety, was generally thus, going by fourths, with an interpolated Third:—



Discant Viol or Treble Viol. Tenor Viol or Viola da Braccio. Bass Viol or Viola da Gamba.

There was a double-bass of the viol family, and this still survives, with its flat back, its sloping shoulders, its slanting upper-back, and its tuning by fourths. It is the double-bass or contrabasso of our orchestras. Up to about the seventeenth century all viols were fretted (like the guitar), usually by narrow slips of hard wood or metal let into the neck, and giving the position for the various stops.

**VIOLA** is simply the Italian word for fiddle. In mediæval times, therefore, it meant *VIOL*, and especially the large tenor viol which had to be rested on the knee and against the left arm, and which was bowed, like the violoncello, underhand; hence called *viola da braccio* (of the arm) to distinguish it from *viola da gamba* (of the leg), the bass-viol.

In modern times the name has passed to the tenor violin, not so large an instrument as the tenor viol, and hence playable violin-wise, but needing a long arm in the performer and a large hand to manage the scale, much wider than that which violinists' fingers have to cover. It is fingered and played precisely on the same principles as

the violin, and its pitch is a Fifth lower—that is to say, an Octave above that of the violoncello. Its compass is from bass *c* to the *c'''* above the treble staff, and its music is always written in the alto staff, where the C-clef occupies the middle line. Its function is usually to fill in the middle notes of the harmony, beneath the violins and above the violoncellos. Berlioz has, however, written a superb symphony for solo viola and orchestra, "Harold en Italie," originating in a request made to him by the famous Paganini, who was as fine a violist as violinist; and all the best composers are careful to use its peculiar melodic colour in passages of a solo character in the course of great works. (See Mendelssohn's use of them in "Lord God of Abraham.") The viola has a quiet but very penetrating tone, slightly wanting in ring, but rich and full and very pleasing, especially as an accompaniment.

**VIO'LA BASTAR'DA.** See next article.

**VIO'LA D'AMORE**, a viola da braccio, or tenor viol, with added sympathetic strings. These were seven or eight in number, and were tuned to the notes of a diatonic scale; or in some instruments they were twelve or thirteen, tuned to the notes of the chromatic scale; and they passed through holes in the bridge, and so along beneath the finger-board to a set of tuning-pins of their own in the sides of the peg-box, distinct from the ordinary tuning-pegs. They were of fine steel or brass, the strings played upon being of gut, open or covered, as usual. These latter were usually seven in number.

The object of the viola d'amore was to increase the power of the tenor viol, and its name ("of love") refers to the sympathy which sets the unstopped strings into vibration when the stopped strings are played. It dates from the sixteenth century, and though it is the most celebrated, is not the only member of its family. On the contrary, there was the violino d'amore (a treble viol with sympathetic strings) and the viola bastarda (a viol da gamba similarly treated), which later on developed into the favourite viola di bardone or BARYTON. The tone of the viola d'amore is singularly attractive. It is to be regretted that it is practically obsolete. It was essentially a solo instrument, and has quite dropped out of use owing to its unfitness for purposes of harmony. Occasionally, even in solo playing, the sympathetic strings clash with the progress of rapidly changing chords.

**VIO'LA DA BRAC'CIO**, the tenor viol (or viol of the arm), sometimes called *viola da spalla* (i.e., of the shoulder), because of the way of holding. See the articles VIOL, VIOLA.

**VIO'LA DA GAM'BA** (or viol of the leg), the bass viol, so called from the way of holding it, which was the same as that adopted for our modern violoncello. For its general construction and form, the tuning of its strings, &c., see the article VIOL.

The "viol de gambours," on which we know from Shakespeare Sir Andrew Aguecheek was so proficient ("Twelfth Night," i. 3), was in Elizabethan times already a great favourite, and England remained faithful to it long after other countries had abandoned it in favour of the more sonorous, though more difficult, violoncello. Indeed, the viola da gamba cannot be said to have become extinct as a popular instrument in England till almost the beginning of the present century. Its tone was very pleasing and penetrating, though thinner and less powerful than that of the violoncello; and the ease with which chords were produced upon it, made it very valuable for purposes of accompaniment. It was much played in historical concerts at the International Exhibition (Music) of 1885.

**VIOLARIÆE** or **VIOLA CÆE**, an order of plants belonging to the group Polypetaleæ, cohort Parietales. [See BOTANY.] About 240 species are known, almost world-wide in their distribution. They are generally herbaceous plants, but those found in South America are often shrubs.

The leaves are alternate, simple, and furnished with stipules. The flowers are hermaphrodite, regular or irregular, axillary, solitary, or arranged in cymes, racemes, or panicles. The calyx consists of five persistent sepals, usually elongated at the base. There are five hypogynous petals, generally unequal in size, and one usually spurred. The stamens are usually five, inserted on a hypogynous disc, with the anthers erect and often connate in a ring round the pistil, the connective being prolonged beyond the lobes of the anther. The ovary is one-celled, free, with numerous ovules borne on three parietal placentas. The fruit is a capsule, opening in three valves. This order is divided into four tribes—*Violeæ*, of the chief genera are *Viola* and *Ionidium*; *Pappayroleæ*; *Alsodiceæ*, chiefly tropical shrubs with nearly regular flowers; and *Sauvagesiæ*, tropical, with usually numerous stamens, the outer of which are barren.

The *Violariææ* possess in a greater degree emetic properties, which reside chiefly in the roots. The roots of some South American species of *Ionidium* are used instead of ipecacuanha. *Ionidium microphyllum* is used in Peru as a cure for tubercular elephantiasis. The roots of *Ionidium suffruticosum* are used in India in diseases of the urinary organs. The roots and seeds of the Sweet Violet (*Viola odorata*) are purgative. Species of the *Viola* (VIOLET) are extensively cultivated for the beauty and fragrance of their flowers.

**VIOLET** (*Viola*) is a genus of plants, the type of the natural order VIOLARIÆE. The species are about 100, natives chiefly of the temperate parts of the northern hemisphere; a considerable number are found in the mountain-ranges of South America. They are mostly perennial herbs, with alternate leaves furnished with persistent, often leaf-like stipules, and with solitary irregular flowers on axillary peduncles. The stem is sometimes creeping (*soboles*), and sometimes, as in the sweet violet, there is no apparent stem.

The Sweet Violet (*Viola odorata*) is a native throughout the whole of Europe, and in Siberia and China. It is common in England, but is a rare plant in Scotland and Ireland. Wherever this plant grows its delicious scent has made it a great favourite. The flowers are very variable in colour, being purple, blue, lilac, or white. The Neapolitan violet, with pale blue double flowers, is a variety of this species. Other double kinds are cultivated in gardens. The purple sweet violet has been made the emblem of the Napoleonic dynasty in France. But the violet of classical writers, especially associated with Athens, is considered to be the Stock gilly-flower (*Matthiola*). The Hairy Violet (*Viola hirta*) flourishes in thickets and groves throughout the whole of Europe, and is not uncommon in England, though rare in Scotland. It has inodorous flowers, pale blue or sometimes white in colour. The Dog Violet (*Viola canina*) is common in Britain, and abounds in hedges, thickets, and heathy grounds throughout almost all Europe, in Japan, Persia, the north-west coast of North America, and the Canary Islands. The flowers are blue and scentless. The Wood Violet (*Viola sylvatica*) is nearly allied to the last species, with which it agrees in having an ascending herbaceous stem and scentless blue flowers. It is common on hedgebanks and thickets in Britain. The Heart's-ease or Pansy (*Viola tricolor*) is very common in fields, meadows, and woods in Britain and throughout Europe. The wild species has usually the upper petal purple, the lateral petals bluish, and the lower one yellow. Numerous varieties have been established in cultivation, to a large extent by crosses with *Viola altaiæna*, a native of Tartary, and *Viola grandiflora*, a native of Switzerland. [See HEART'S-EASE and PANSY.] Several other species are British. Some of the species of violets were formerly used in medicine. A syrup made from the flowers of the sweet violet is sometimes administered to children as a

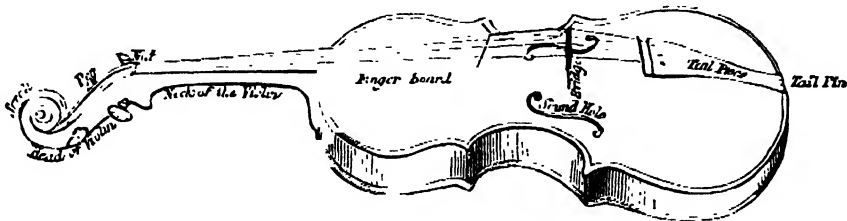
laxative; its roots and seeds have purgative properties. The dog violet is said to be beneficial in skin diseases.

**VIOLET, ANILINE.** Hoffman's violet. See ROS-ANILINE.

**VIOLIN**, the principal instrument of the most distinguished class of our present musical instruments, namely, the class of stringed instruments played with a bow. The other members of the violin family are the viola and violoncello. Of a closely allied, but somewhat different, family of the same class is the double-bass, also called violone or contrabasso.

The three violins and the contrabasso are collectively called the "strings," and form the foundation of all modern orchestras. The reasons for this are not far to seek. The tone of the "strings" is less exciting than that of the

"brass," and more definite than that of the "wood-wind," therefore it can be listened to without fatigue for a much greater length of time, and compositions of large dimensions become possible. No one could listen for a whole afternoon to quartets by wind instruments—the tone would pall upon the ear; whereas many musicians find the highest pleasure in listening to good string quartets one after the other. Further, players on wind instruments easily get fatigued, and must rest or play badly, whereas violinists can play for long hours without ceasing, and not only can, but do, as many humorous tales at their expense delight in recording. Finally, the variety of effects by different methods of bowing, the extreme power of rapidity, the large compass, the power of playing chords to a considerable extent, the easily accomplished *sostenuto*, the excellent facility of



Violin.

blending with every quality of musical tone, and, above all, the command of the most delicate shades of expression, from *pianissimo* to *forte*, onrivalling all other instruments and closely approaching the human voice—these are some of the reasons why all the great composers regard the "strings" as the backbone of the orchestra.

The **VIOLA**, **VIOLONCELLO**, and **CONTRABASSO** are elsewhere described: the present article will, however, deal with the general history of the class, as well as give an account of its chief member, the violin.

To describe the violin is hardly necessary, since it is in every one's hands. The *head*, surmounted by a *scroll*, contains four tuning *pegs*: from these the four strings of the instrument pass over the *nut*, then along and above the *finger board*, which rests for most of its length upon the *neck*, to the *bridge*, which they cross in their passage to the *tail-piece*, where each string passes through its respective hole, and is held by a knot on the other side. The tail-piece is prevented from being drawn upwards, when the tuning pegs are turned and the strings are strained, by its loop, which is fastened round the peg or "tail-pin," at the bottom of the instrument.

The *bridge* is placed upon the *belly* transversely to the strings, and has small notches for the latter to rest in that they shall not slip sideways; the *sound-holes* are cut in the belly, one on each side of the bridge. The *back* corresponds in modelling to the belly, and the ribs are the vertical sides connecting back and belly to form the *body* or resonance-box of the violin. On the left side, within the body, under and parallel with the bass string, is the *sound-bar* (or "bass-bar"), which strengthens the belly on its under side to support the pressure of the left foot of the bridge. On the right side, nearly under the right foot of the bridge, but about three-sixteenths of an inch lower down, a small cylindrical post, called the *sound-post*, holds the back and belly together and gives support to the right foot of the bridge. At the top of the body, inside the violin, is a good-sized block, carrying the ribs, belly, and back, and giving a firm grip for the neck. Into the corresponding block at the bottom of the body is fixed the *tail-pin*. On each side of the body, at the corners, are two corner blocks, giving support to the curving ribs, and to the back and belly. Curved slips or linings, following the outline closely, are glued within the body to the back and the ribs, and to the belly and the

ribs to strengthen the joints. Altogether there are at least fifty-eight pieces in the violin, and if we are to count the strings, the purfling (a decoration of marquetric-stringing running round the back and belly just within the outline), &c., we reach the total of seventy separate parts. The total tension upon the strings varies from 52 lbs. to 63 lbs. (as exactly measured by Mr. Hart and other observers on an average specimen in 1881), according as thin or thick strings are used; the vertical pressure on the bridge is from 23 to 27½ lbs., and is unequally divided; the pressure on the bass (left) foot being from 9½ to 11 lbs., and that on the treble foot from 13½ to 16½ lbs. A little higher bridge and a little more pronounced inclination of the neck would add half as much again to these figures. It is certainly astonishing that so slight a framework can bear so great a pressure for centuries without being utterly crushed; and there is no need, as many do, to exaggerate these sufficiently heavy figures. The strings of the violin are of cat-gut (really made from the intestines of the sheep, not the cat), and increase in size from the first (treble) to the fourth (bass), the last-named being weighted by a "covering" of closely spun copper-wire, silvered over. The viola and violoncello have two "covered" strings. The contrabasso, strung with only uncovered strings, has them of great thickness.

The strings of the violin are tuned in fifths thus:—



and the lowest note is therefore *g*, the next note above bass-*f*, the *f* of the F-clef or bass clef; while the upper range is almost unlimited. For the orchestra it is most unusual to write above *a'''* or at the outside *e'''* (the piano-forte reaches to *a'''*, which is the A above these notes), though Mendelssohn in the "Midsummer Night's Dream" music has taken his first violin up to *e'''*. By bowing two or more strings at once, and suitably fingering them, chords may be played upon the violin, and it is quite usual in passages demanding rich colouring for the first violins to play in double notes, the seconds completing the chords by

another pair of double notes. It requires, of course, an intimate knowledge of the instrument to be able to write for it in chords. In like manner fine passages of arpeggios are produced with complete ease upon the "strings," and are especially in great use for accompanying purposes. Another orchestral effect of brilliant colour is the *tremolando*, where extremely rapid vibration of the bow produces a trembling flutter expressive of agitation of mind beyond any other device of the orchestra. Yet another is the *pizzicato*, where the strings are plucked (like a guitar) instead of being bowed. This is most effective upon occasion, but must be most sparingly used, as it readily becomes vulgar. A beautiful effect in passages of melody demanding great expression is given by the *close shake*, which is a rapid tremulous motion of the wrist, causing the finger to waver upon the string and the tone to vibrate as the human voice does under the influence of strong emotion. This also is an effect not to be too lavishly employed. The harmonics of the violin family are produced by lightly touching the string at a node, when a flute-like quality of tone is produced, very sweet and pure: they are not much used in orchestral work, but are of frequent service in solo playing. Whole passages may be played in harmonics by suitable fingering, the written appearance being curiously unlike the effect produced, as may be seen on referring to the passage given as a sample in the article HARMONICS. Occasionally the strings in the orchestra are *muted* ("con sordini"), the *sordino* or mute being a small clip which by pressing the bridge checks its vibrations and weakens the tone, at the same time imparting to it a curiously reedy or nasal character. It is not an effect to be frequently used.

The invariable division of the violins in an orchestra into firsts and seconds has been casually alluded to. The highest part is taken by the first violins, which usually are to the left of the conductor, the second or alto is taken by the second violins, the third or tenor by the violas, hence called "tenor fiddles," and the lowest or bass part by the violoncellos. The contrabassos play the same notes with the violoncellos, but an octave lower in pitch. Thus the "string quartet," as it is often called, is formed for the orchestra. Frequently composers divide the strings still further, as when two viola parts, and two violoncello parts, give complete harmony, a device of Wagner's—or when five violoncello parts introduce Rossini's overture to "Guillaume Tell"—or when the violins have four parts to themselves, as in the ethereal prelude to Wagner's "Lohengrin," one of the most exquisite passages of modern music. In Wagner's "Tristan" (act 2) there are at one point no less than fifteen separate parts among the strings.

The tone of the violin originates with the strings, set into vibration by the bow. As the bow is drawn across the string it "bites," a little resin assisting it in this, that is, it drags the string sideways, until the elasticity of the string frees it, and it flies back: this dragging and release continue in extremely rapid alternation, and the vibration thus gained is controlled by the length of the string. The vibrations of a violin string may be examined and figured with great accuracy by the help of a "vibration microscope," or other such apparatus. Illustrations of them will be found in the articles on STRINGED INSTRUMENTS and VIBRATIONS. The power of a vibrating string would be little, without a soundboard to increase the tone by enlarging the vibrating surface. The usual theory is, that the vibrations of the string are transmitted by the right foot of the bridge, onward by the sound-post to the back, the bridge-foot and sound-post being not far from in line together; the left foot of the bridge is free to vibrate, and carries with it the belly, the vibrations being referred to the right foot as a centre. The soundpost is called the "soul" of the violin (*l'âme du violon*) in French, and the "voice" (*stimme*) of the violin in German, so important are its functions held to be.

*History.*—The name of the violin or fiddle (for both words are really the same) at once shows its derivation. The Latin *fides*, a string, and its diminutive *fidicula* were used for the lyre. Hence come the southern group of *fidula* (Low Latin), *vihuela* (Spanish), *viola* (Italian), and the northern group of *fidelle* (Gothic), *vielle* (French), *filtele* (Old English), *fiedel* (Old German). From *viola* we get the Italian diminutive *violino* and the French diminutive *violon*, while the Italian *violino* is shortened into the English *violin*. Then again from *viola* we get the augmentative *violone*, and from this latter we derive *violoncello*, i.e. a small violone. *Viola* itself becomes in French *viola*, and in English *viol*. The *viol* is therefore the Italian, and the *fiddle* the Teutonic version of the same word.

From the lyre (*fidicula*) we derive the fiddle. To the strings of the lyre were added a bridge and a finger-board, and we get the English *crwth* (see the figure in Plate 1, VIBRATIONS), which was either bowed, or plucked, or worked with a wheel (*chrota* or *rota*) hurdy-gurdy fashion. The better form of this was the French *vielle* of the troubadours, or the Spanish *vihuela*, where the side arms of the *crwth* are dropped out, and the sound-box becomes rounded. But first we get the English rebeck, with a rounded contour and a rounded-back, solid for the most part, but cut down by a step about the middle of its oval part, and the hollow thus made roofed over by a sound-board, with sound-post, sound-holes, and bridge complete.



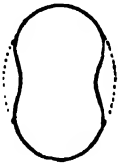
English Rebeck—MS.  
of Eleventh Century.



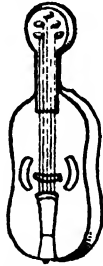
German Geige—Sculpture  
of Thirteenth Century.

This was the favourite "jocond rebeck" of English mediæval life, a shrill-voiced instrument of little compass. It lasted in bye-streets or country places a full century after the viols had driven it from the better quarters of the towns. It had usually three strings, though, as our illustration shows, the better kinds had four. The corresponding instrument in Germany was the *Geige* (so called because of the jiggling motion of the fiddler's bow-arm), and this soon began to develop a neck for the production of greater compass, to let the body become a hollow box as an improvement on the partly hollowed body of the rebeck, to enlarge the sound-holes, and to improve the contour. By the thirteenth century we find it advanced to this state in the sculptures of Cologne Cathedral. From these quaint early fiddles developed the *vielle* (fiddle, guitar, and hurdy-gurdy all in one), finished indiscriminately for either purpose, as the demands of the purchaser inclined. But the *vielle* had taken an enormous stride. It had a flat belly and a flat back, like the guitar; whereas the *crwth*, rebeck, and *geige* had curved backs, lute-fashion, almost hemispherical in shape, or, to put it rather more nearly, of the contour of half a pear. They preserved the old idea of the lyre, the "strung tortoise-shell," just adding a flat resonance table; but the *vielle* first possessed a complete resonance-box. To get this it was necessary to invent ribs; and ribs (or sides) once invented, there seemed no reason for not increasing the size of the body of the instrument. A limit was soon found in the obstacle a wide vielle presented to the motion of the bow, and the widest part of the oval was therefore curved into a contrary flexure by this com-

pulling necessity—the beginning of the well-known “bouts” of the fiddle, which give the “waist” to the instrument. The finger-board is observed to have already arisen. This



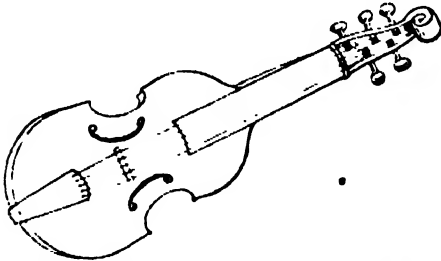
Origin of “Bouts.”



Vielle of the Troubadours  
 (“Fidel” of Chaucer).

is the “fidel” of Chaucer, and is really very closely paralleled by the guitar of to-day in many of its points.

There now remained but very little essential change to produce a viol. The pegs were inserted at the side of the head instead of on the face, the neck was immensely enlarged, the “bouts” were more deeply curved, the general contour of the body made more pear-shaped, that is, the lower curves fuller than the upper, and where these curves sharply intersected the bouts, corner blocks were inserted, enormously increasing both the strength and the resonance. The back remained flat, but the belly was beautifully curved. The strings were at first four, but eventually six in number, and occasionally even seven, and the tuning was chiefly by fourths. [See VIOL.] The flat back and



Five-stringed Viol (late model; the four corners almost of violin pattern).

deep ribs of the viol survive in the violone (contrabasso), but the violoncello has driven out the bass-viol or viola da gamba, and the tenor violin has not only driven out the tenor viol, but stolen its name also (viola). The violin itself was the first of the family to gain a great victory, and completely extinguish the treble viol. The violin differs from the viol in its back being arched in the same



Stradivari Violin.

way as the body, which, while improving the fullness of the tone, also reduced the thickness of the instrument at the edges, in its four strings always tuned in fifths, in the shape of its head and “scroll,” in the ribs meeting

the neck abruptly instead of by a slope, in both the corners of each bout being acutely angular, and in the form and position of the sound-holes. The last two characters may be termed especially characteristic of the violin; but they were quickly copied by the viol makers, so that the flat back and sloping shoulders soon alone remained to distinguish the earlier instrument. As the tone of the viols was sweet and penetrating, it was natural that they should persist longer in the bass instruments, and the violoncello, which is a large violin, only completely replaced the viol da gamba about a century and a half ago; while the double bass, which is the great viol, the violone, with its flat back, its sloping side curves, and its strings tuned by fourths, is still the bass of our orchestra. For here we want a penetrating rather than a powerful tone, and hitherto contrabass violins have not been at all successful against the old double-bass in viol form, in those experiments which have been made.

**Violin Makers.**—The arched back was applied to viols experimentally (such a viol—five-stringed with two bourdons additional—having been shown in the great International Exhibition, “Music and Inventions,” of 1885), and the tuning by fifths was also elsewhere applied; so with other differences. Thus the violin developed gradually from the treble viol, and we cannot point to any break or sudden departure. But the earliest instruments which combine every essential of a violin are those said to be by Gaspar Duiffoprugcar, a Tyrolean, whose true name was Tiefenbrücker. He lived at Bologna in 1510, went to Paris in the train of Francis I. about 1516, and died in France. These violins are gravely doubted. Certainly there is no mention of a violin in any writing till much later. Duiffoprugcar was a mosaic worker, and his instruments are richly inlaid. If then Duiffoprugcar is semi-mythical, what is one to say of Joannes Kerlino, whose fiddle is dated 1449? Especially when it appears (in 1804) from the hands of a noted “restorer,” and appears upon close examination to have been altered in shape, probably from a viol. Fétis, the musical antiquary, firmly believed in Kerlino, but he is now discredited altogether.

With the next name we touch firm ground. Gasparo da Salò, born at Salò, on the Lago di Garda, and living at Brescia from about 1560 to 1610, may be taken, for want of better evidence, as the inventor of the violin as we know it. He is the first maker who gives the four “corners” of the true violin pattern. Even sound-holes have the recognized shape. Most beautiful and perfect instruments by Gasparo exist still. That played on by Ole Bull was believed, at all events by its fortunate possessor, to be unrivalled. The instrument is now mute in some “collection,” probably American. The writer of this notice has handled violins by Gaspar of fine sonorous tone and marvellous manufacture. His viols and double-basses have a prodigious reputation. Of course so fine a result as these Brescian instruments could not have been attained by one man, and perhaps some day a predecessor to Gasparo, less shadowy than Duiffoprugcar, may be found. Pupil of Gaspar was the great Maggini (worked from 1590 to 1630), still finer in manufacture and often grander in tone. Gaspar was in fact a very unequal maker, frequently altering his model as if in perpetual experiment. De Beriot’s Maggini was as special an instrument as Ole Bull’s Gaspar, and also ranks among the greatest of all fiddles. Other Brescian makers there were, but they need not here be mentioned.

Some say that a certain Giovanni Marco da Busseto (i.e. born at Busseto, where Verdi lived the first and the last years of his life) went from there to Brescia, and worked with Gasparo da Salò, or even a little before him; and that from Brescia he went to Cremona and taught Andrea Amati. Certainly the high curves (making the body of unusual thickness), which are so distinguishing

a mark of the Brescian school, are found in Andrea's work. What violins of Andrea Amati (1525-95?) are extant (they are very scarce) are highly esteemed, especially historically. A set of twenty-four instruments of all sizes made by him for Charles IX. of France for the Sainte Chapelle was famous for its beauty. Unfortunately the whole set disappeared in 1792, at the French Revolution.

Sons of Andrea Amati were Antonio and Girolamo (Antonius and Hieronymus), distinguished makers; and son of Girolamo was Nicolo Amati (1596-1684), the *great* Amati, and the perfecter of the Cremonese form in all its beauty. In fact Nicolo Amati made his fiddles too beautiful, the curves were so flowing and the corners so sharp that it is rare to find one not badly damaged. The later makers prudently quieted down the curves, and gained greater stability. To the artist's eye an Amati of the grand model is a treasure beyond price. His son was also a maker, but of only ordinary repute. Nicolo Amati was famous in his day, and had many pupils. Of these we only mention one or two. Francesco Ruggeri was one of these pupils, and a maker of the first class. He worked from about 1660 onwards, and moved to Brescia in 1670. A son and a brother of Ruggeri are also famous.

Andrea Guarneri (1639-95) was a famous pupil of Nicolo Amati, and founder of a family of violin makers yet finer than that of the Amati [see GUARNERIS]; the chief members being Giuseppe, son of Andrea (1680-1730), Giuseppe's son Pietro, and also his brother Pietro; and his cousin and pupil, another Giuseppe, called "the great Joseph," or "Joseph del Gesù" (1683-1745), who is admittedly, when at his best, the greatest of all violin-makers, save Stradivari alone. Paganini's wonderful violin was a "Joseph," and it is now in the museum at Genoa.

Greatest of all the pupils of Nicolo Amati is Antonio Stradivari (1644-1737), whose name is known as widely as music itself. [See STRADIVARIUS.] Two sons worked with him, but never rose to great eminence. It is needless to say that the many "Strads" one sees or hears of are nearly all forgeries. The total number of genuine Stradivari violins in existence (which are all known and described) is not 200, and they are scattered all over Europe and America.

Pupils of Stradivari were Alessandro Gagliano, who migrated to Naples about 1695, and whose son Gennaro is also a maker much esteemed. Lorenzo Guadagnini, who worked at Piacenza from 1700 to 1743, and whose son and grandson were also makers of repute; Domenico Montagnana, a maker of the first rank, especially of violoncellos (Cremona and Venice, 1700-10); and the best of all, Carlo Bergonzi, whose finest work was done at Cremona from 1720 to 1750. His violins are scarcer than his violoncellos: the latter are superb.

It is noticeable that Nicolo Amati, Antonio Stradivari, Giuseppe Guarneri, Domenico Montagnana, and Carlo Bergonzi, were all living and working at Cremona together, and from the death of the first to the death of the last is not much over fifty years. The Cremonese school endured without interruption into the present century: for Lorenzo Storioni, the last maker of the great style, died at Trieste, whither he had removed from Cremona, in 1801. A fine school of violin makers existed also at Milan, founded about 1675 by Giovanni Grancino, a pupil of the Amatis. Pupil of Grancino was the excellent maker, Carlo Giuseppe Testore, who worked from 1690 to 1720, his sons helping him. Contemporary with them, but slightly later, is Carlo Ferdinando Landolfi, a very renowned maker, and by far the grandest of the Milan artists. The makers of specially Italian reputation, not as yet much known to English connoisseurs, but of the very highest rank, are Pietro and Tommaso Balestrieri, pupils of Pietro Guarneri of Mantua, sons of Andrea Guarneri of Cremona. The elder Balestrieri worked about 1750.

Of German makers the Tyrolean Jacob Stainer is by far the most important (1621-83). [See STAINER.] He was a most original and enthusiastic workman. The family of Klotz, in the eighteenth century, made Mittenwald, in the Bavarian Tyrol, well known for good ordinary fiddles.

Of French makers, Nicholas Lupot, the descendant of a long line of fiddle-makers (1758-1824), is highly esteemed. Spohr played on a Lupot for several years. Pique, a contemporary, was also liked by Spohr. J. B. Vuillaume (1798-1875) has a very curious reputation. He, like Lupot, was a fiddle-maker by long inheritance, but he found people would not give him fair prices for his work, excellent though it was. He then imitated Stradivari, Guarneri, and Amati so closely that connoisseurs might be deceived, at all events as far as appearance went, and forgeries though these were, he is considered to have saved his honour by selling them as forgeries, or if the word be preferred, as "imitations." Generally it is not considered fair to "imitate" in this way, even to signing violins with the names of the great makers. The purchasers were not by any means so scrupulous, nor were other makers, and it is largely to Vuillaume that the low morality attaching to fiddle-dealing has become so scandalously common. Now there are but very few dealers whose honour is above suspicion, whom the public know and trust, and who, in consequence, make handsome incomes by giving "opinions" apart from their own business as dealer. Vuillaume it was who flooded the market with "genuine Duifoprugears," inlaying and all. Yet he passes as a maker, and his name is held in honour. Perhaps the large fortune he amassed in this curious way has something to do with this opinion. When Vuillaume became known he removed to Paris, but in his early time his factory, with those of other "imitators" like him, was at Mirecourt, near Luneville, in France, which ever since has competed with Markneukirchen, in Saxony, in the production of cheap (and worthless) fiddles. The wholesale prices of the cheapest of these things range from 8s. 8d. per dozen upwards! Such figures suggest rather the wares of the toyshop than the material of the musician.

English violin-makers of celebrity are not a numerous race, but there are some few excellent men; for instance, Benjamin Banks (1727-96) of Salisbury is excellent, particularly for his violoncellos. His sons did not equal their father. Richard Duke, a contemporary, had also great merit. Better than either of these was Daniel Parker, flourishing about 1720, who rivalled his great Italian contemporaries for fine wood and varnish, and good form, and above all, rich tone. His violins are frequently taken as Cremonese by those who are not experts. The family of Forsters, beginning with William Forster of Brompton (1713-1801), or as some say with his father, rose to eminence in the person of a second William, son of the first, and known as "old Forster" to violinists. Old Forster (1731-1808) was perhaps our best native maker. He removed to London, was fortunate enough to please the Duke of Cumberland and George III., and following the Amati model produced instruments of really good quality. His son, "William Forster, jun." (1761-1824), though showing ability, is not to be put on a level with his father. A good violoncello by "old Forster" is really an instrument worth special notice. The family continued to make violoncellos in later generations. Bernhardt Fendt (1775-1832), a Tyrolean and a refugee from France at the time of the great Revolution, and his sons Bernhardt Simon (1800-51) and Jacob (1815-49), are also deserving of mention; as is Dodd, the master for whom the first Fendt worked before setting up for himself. Dodd is also excellent as a maker of violin bows, and is equalled in this difficult art by James Tibbs of the present day. (Dodd died in the workhouse from



Inebriety, 1839.) A good Dodd or Tubbs is for all practical purposes equal to a François Tourte (1747-1835), the more celebrated French contemporary of Dodd, though the prices they fetch would of course vary in a surprising degree.

One word as to the prices of Cremona violins may not be amiss. With every year these violins grow scarcer—first, because they actually perish; secondly, because of the craze for violin-collecting, so that a Gillott will lock up his hundred or so of fine instruments and deprive as many musicians of a priceless means of tone-production, to the great damage of society at large. Added to our own drain comes that of American speculators, avid for anything antique and costly to hide the newness of their money gains. We find it recorded that when Tarisio, the famous collector, died, Vuillaume was able to purchase 250 Cremona violins, violas, and violoncellos, of the most superb quality (one of them a Stradivari absolutely untouched, just as it left the maker's hands) for £3166 from the executors, an average of rather under £12 15s. a-piece. Probably the Stradivari violin referred to would, by itself, now fetch half the sum paid for the entire 250, did not its owner (the violinist Alard, son-in-law of Vuillaume) rightly consider it of priceless value to himself as an artist. This may sound exaggerated to those who do not know that Stradivari violoncellos of fine quality command £750 and upwards, and his violins £150 to £200 more than that. To be specific, at the Hotel Drouot in Paris, a Stradivari violoncello of 1689 was sold in February, 1887, for £760, to a professor at the Conservatoire for his own use; while at the same sale a fine Ruggeri violin of 1660 fetched £1280, and who would compare Ruggeri with Stradivari? Again, at the same sale, a Tourte bow was sold to Hill of London, the famous dealer, for £44. That professors and dealers will give these sums shows, of course, that amateurs are willing to give even more!

Anything is worth what it will fetch, but unless that narrow definition of value is taken, these enormous prices must be set down to the account of the "collectors." A Stradivari is like a Raphael; for every one that is to be sold (remembering that there are not 200 in all) there are, literally, thousands of purchasers, many of them with pockets apparently bottomless. But for the musician, who only wants a fine instrument for his actual use and our delight, to compete with these gentry, whose noble object is to lock it up from us, silent and melancholy, in a glass case, is madness. There is as much nonsense talked, moreover, about fiddles as about pictures or wine, and as much trickery as in horse-dealing. Still every judge of tone must admit that Cremona instruments, at all events all those of the five great makers, are really, and apart from any fictitious fashion or craze, the finest tone-producers the world has ever seen, save only the human voice at its best.

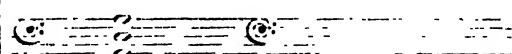
Now, where is the secret? That is the puzzle which Tourte has not been solved. It certainly is not in the shape, for these great makers differ widely both from one another, and from themselves at different periods; nor is it in the finish, for some of the Josephs are really rough, fine in tone though they be; nor is it in the varnish, for each man has his own; and even he will alter, during his life, from one style of varnish to another. It is not in the age, as contemporary records prove superabundantly, for the great makers were recognized far and wide in their own lifetime, and their special merits acknowledged as heartily as they are now. There seems some reason to think it may be in the wood, especially the wood of the belly (pine), and certainly to see the way in which the old masters will patch and piece a bit of favourite wood with endless pains, bears out the view. There is a whole set of violins by Guarneri which is recognizable by a particular stain in the grain. He must have heard that precious piece of wood to the

last chip. Connoisseurs of large experience declare that they know some three or four "trees" of Stradivari. We know, moreover, that Stainer would spend whole hours walking through the forest, tapping and chipping the trees, to find a log that suited him. But when all is said it is but guess-work. In one word, violin-making in the years circling round 1700 as a centre, was at Cremona a veritable fine art, it is now a miserable trade. Who could tell what we could ourselves produce, in these later days, if we gave to the work the life-long study, the ceaseless diligence, the fine perception, the all-embracing knowledge, which those old artists gave to their work? We have seen above what was the career of Vuillaume. No one will now pay a man enough to live upon for a modern violin made as it ought to be made. Stradivari grew rich by his art, his violins fetched excellent prices. His patrons would give him handsome gratuities. Witness the Duke of Modena, who sent him £25 of our money beyond the agreed price for a violoncello, in 1686, so delighted was he with the tone of the instrument. But our violin-makers have to live by hurried copying, or by producing trade manufactures at so much the dozen: no one has power to devote time and thought to the work. The amateurs who possess the time and money have not as yet the knowledge. It is to be hoped, however, that with the rapid progress in music, and the consequent shaking off of the tyranny of fashion, a market will arise for good and genuine modern violins; if that be so, it is the belief of many that the violins to supply that market will not be wanting, though a little time and patience may be necessary at first.

Of works on the violin, the following are good:—"The Violin," by G. Hart (London, 1884), full, interesting, and in the main correct and unprejudiced; "Old Violins," by J. M. Fleming (London, 1883); "History of the Violin Family," by Carl Engel (London, 1884); "Violin-making as it was and as it is," by E. Heron-Allen (London, 1885).

**VIOLONCELLO** by its name should mean a "small violone"—i.e., a reduced model of a contrabasso, which would practically mean a VIOLA DA GAMBA. But the violoncello is, on the other hand, a large violin; it is in fact the largest member of the violin class, differing little except in size from the violin itself. The most important distinction between them is in the much greater depth of the ribs or sides in the violoncello, than in the violin.

The tuning of the violoncello is by Fifths, and the pitch of its string, and its general compass, are indicated below;



but as to the latter it is evident that it is only limited by the skill of the player. Signor Piatto, as the present writer can testify, could perform the most difficult violin music upon the violoncello.

The violoncello in an orchestra plays the bass part, and is accompanied by the double basses an octave below it. But it is also largely used for solo passages. The opening of the overture to "Guillaume Tell" and dozens of passages in Mendelssohn's works ("But the Lord is mindful of his own," for example), will occur at once to the mind as cases in point. In rapid bass passages the violoncelli are not accompanied throughout by the heavy slow-moving bassi, but the latter play the principal notes of the groups, every fourth note, every third note, or the like, so as to keep the general effect of the passage.

The *pizzicato* (i.e., plucking strings instead of bowing them) has a very fine effect upon the violoncello, and is largely used to give edge and point to the duller throb of the heavy contrabasso.

**VIOLONE.** See CONTRABASSO.

**VIPER** (Viperidæ) is a family of venomous SERPENTS forming with the RATTLESNAKES (Crotalidæ) a group, Solenoglypha, which is distinguished by having the maxillary bones very short, and armed with a pair of perforated poison-fangs, and the lower jaw and palate furnished with small curved teeth. The vipers have a large broad head, triangular in shape, and covered on the top with small plates and scales; there is no pit between the eye and the nostrils, as in the rattlesnakes or pit vipers. The tail is short and tapering. There are about twenty species, found in the warmer parts of the Old World, especially in Africa; one species is a native of Australia; but none are found in America.

The Common Viper (*Pelias berus*), the only poisonous reptile found in Britain, has been described under the title ADDER. The Horned or Cerastes Viper (*Vipera cerastes* or *Cerastes hasselquistii*) is a native of North Africa, Arabia, and Western Asia. This species was well known to the ancients, and appears figured on the monumental relics of Thebes. This is the snake of which Herodotus (lib. 2) speaks in the following passage:—"There are about Thebes sacred serpents, entirely innocuous to man; they are of diminutive size, and have two horns sprouting from the crown of the head; when they die they are buried in the temple of Jupiter, to whom they are said to be sacred." Herodotus was in error in saying that these snakes were innocuous. Perhaps he had examined only tame individuals from which the poison fangs had been extracted, or confounded the Cerastes with some truly harmless species. This snake was devoured by the sacred ibis. The horns are developed only in the male, and are slender-pointed spines arising over the eyelids. The Cerastes viper is about 14 inches long, ranging in colour on the upper surface from ashy-gray to reddish, with indistinct spots. It is a sluggish animal, lying buried in the warm sand, but displays considerable activity when provoked. Several species of the genus *Vipera*, including some nearly allied to the Cerastes, are found in South Africa. The PRINCE ADDER (*Vipera* or *Crotalus arietans*) is one of the most venomous of these. The Indian vipers belong to the genera Daboia and Echis. The Daboia or Russell's Viper (*Daboia russellii*) is a very venomous species found in many parts of India, Burma, and Ceylon. It is about 50 inches in length, of a light chocolate colour, marked with large black white-edged rings. It is nocturnal in its habits, and preys on rats, mice, and frogs. It is indolent, but hisses fiercely when disturbed, and strikes with great vigour. The Echis (*Echis carinata*) is a small species scarcely 20 inches in length, ranging from Southern India to North Africa. Its habits are described as active and fierce. A nearly allied genus, Atheris, distinguished by its prehensile tail and arboreal habits, is found further south in Africa. The Death Adder (*Acanthophis antarticus*) is a much-dreaded viper, widely diffused in Australia. See ACANTHOPIHUS.

**VIPER'S BUGLOSS.** See ECHINUM.

**VIRGIL** (*Publius Virgilius Maro*), or perhaps more correctly Vergil (Vergilius), was born at Andes, a small place near Mantua, on the 15th of October, B.C. 70, in the first consulship of Cn. Pompeius Magnus and M. Licinius Crassus. He was five years older than Horace, who was born B.C. 65, and seven years older than the Emperor Augustus. He was instructed in the neighbouring towns of Cremona and Mediolanum (Milan). It is apparent from the writings of Virgil that he had a learned education, and traces of Epicurean opinions are obvious in his poetry. His knowledge of the Greek and Latin classics was practically exhaustive, and he is one of the most learned of poets. When a division of lands in Italy was made among the veteran soldiers of Octavianus, Virgil lost his patrimony at Mantua (B.C. 41), but it was restored to him by Octavianus, through the intercession of some powerful friends,

among whom are mentioned Varus, Asinius Pollio, and Mæcenas. His first "Eclogue" is supposed to allude to the loss of his lands and his recovery of them. He probably afterwards resided at Rome, and he was in favour with Mæcenas, a patron of letters, and with the Emperor Augustus. Horace attributes his own introduction to Mæcenas to Virgil and Virgil's friend Varius. The poet also spent part of his time at Naples and Tarentum. In B.C. 19 he visited Greece, where he intended to spend several years, for the purpose of perfecting his epic poem, the "Æneid." It was on the occasion of this voyage that Horace addressed to him one of his lyric poems ("Carm." i. 3). At Athens Virgil met with Augustus, who was returning from the East, and he determined to accompany the emperor back to Rome; but he fell sick at Megara, which city he visited probably on his road, and his illness was increased by the voyage to Italy. He lived, however, to reach Brundisium, where he died in the autumn of the year B.C. 19. According to his wish his body was taken to Naples, and interred on the Via Puteolana, at the second milestone from Naples. The place of his burial is still pointed out by tradition, though the so-called tomb at Posilippo cannot be considered as the monument of the Roman poet. Virgil's immense fame gave him numerous patrons, and their gifts raised him to ease, if not opulence. He seems to have been very simple in manners, generous, and full of kindly feeling, free from all meanness and jealousy, and to have been universally beloved. His health was always very bad. Alluding to his own weak eyes and Virgil's asthma, Horace once jokingly said that the emperor, when they waited upon him, sat between sighs and tears. Virgil was the favourite poet of the middle ages. Dante especially loved him, and took him as model and hero. But the common people, passing down a tradition of a superhuman genius resident near Mantua, "in the dark backward and abysm of time," from age to age, came to think of him as a wonder-worker and necromancer. Many stories of this character cluster round his name.

The "Bucolica" or Bucolics (i.e., shepherd songs—Gr. *bous*, an ox) of Virgil, were his earliest works, and consist of ten short poems, commonly called "Eclogues," or selections, a name which may have been given them after their author's time. They were probably written between B.C. 41 and B.C. 37. They are not bucolic poems so strictly as most of those of Theocritus: some of them are merely allegorical poems in a bucolic dress. Though Virgil introduces shepherds and rustic scenery and allusions, he fails in giving to these works a genuine rustic character. There are many good lines, but the want of reality makes them cold and unmeaning. He has borrowed many passages from the Greek writers, and especially from Theocritus.

The "Georgica" or Georgics (i.e., songs of agriculture—Gr. *gê*, the earth, *ergon*, a work), a didactic poem, in four books, addressed to Mæcenas, is his most finished work. In the first book he treats of the cultivation of the soil, in the second of fruit trees, in the third of cattle, and in the fourth of bees. The fourth book has but a meagre subject, but it is well handled, and the materials, which would have been insufficient for a book of the same length as the others, are made up by the long story of Aristæus. His taste and judgment were improved when he wrote the "Georgics." The hexameters are models of perfection; rarely equalled, and never surpassed, and yet they run in this splendid way through the whole long poem. If the concluding lines of the fourth book are genuine, Virgil was finishing this poem at Naples about B.C. 30.

The "Æneid" is the great national epic of the Romans. It is said to have been left imperfect, and to have been ordered to be burnt by the poet, conscious of the polish yet lacking to it. But it was published by Tucca and Varius after the poet's death. The poem consists of twelve books, which contain the story of the wanderings of Æneas

after the fall of Troy, and his final settlement in Latium after the defeat of Turnus and the Rutuli. Though the adventures of Æneas are the direct subject of the "Æneid," the glories of Rome and the fortunes of the Julian house, to which Augustus belonged, are skillfully interwoven in the texture of the poem. The foundation of Alba Longa, and the transfer of the seat of empire from that city to Rome, are announced in the first book, by Jupiter, to be the will of the Fates; and the great family of the Cæsars are declared to be the descendants of Æneas. The adventures of the Trojan hero at the court of Dido, queen of Carthage, give occasion to hint at the future rivalry between the Romans and the Carthaginians, and the long contest which was destined to end in the triumph of the descendants of the Trojan hero. The numerous allusions to actual circumstances and to the history of the republic were adapted to create or to confirm a popular notion of the Trojan descent of the Romans. Though the "Æneid" contains many fine passages, its poetical merits are greatly below those of the "Iliad" and "Odyssey." The poem wants the unity of purpose and integrity of construction which so eminently characterize the "Iliad," and it is deficient in that truth and simplicity which form the never-tiring charm of both the "Iliad" and the "Odyssey." But Virgil had other models besides Homer. The poets of the Alexandrine school were his study, and particularly Apollonius of Rhodes, whom he has often imitated. The "Æneid" contains many obscure passages, and though Virgil is generally used for early instruction, and was so used even in his own times, he is one of the most difficult of the Roman poets. Several short poems attributed to him are printed in some editions of his works—"Culex," "Ciris," "Cupa," "Moretum," and "Catalecta," a collection of fourteen smaller poems.

The editions of Virgil are very numerous. The edition of C. G. Heyne's Virgil, by G. P. E. Wagner (Leipzig, 1839), &c., four vols. 8vo, is the most complete. The text may be bought separate in a single volume. Conington's edition may also be strongly recommended.

The German translation of Virgil, by J. H. Voss, is very good. Martyn's prose translation of the "Bucolics" and "Georgics" is a good commentary. Gawain Douglas translated the "Æneid" into old Scottish verse. There are English verse translations by Ogilby, Dryden, and Trapp. Pitt translated the "Æneid," and Joseph Warton the "Bucolics" and "Georgics." The latest translations into English are "The Works of Virgil translated (the first four Pastorals, the Georgics, and the first four Æneids, by the Rev. Rann Kennedy; the last six Pastorals and the last Æneids, by Charles Rann Kennedy)," blank verse, two vols. 8vo, (1849). A fine version, for poetic spirit and accuracy of interpretation combined, is that of Professor Conington, published in 1866. The metre adopted is the octosyllabic, after the model of Sir Walter Scott's "Marmion." Many passages are rendered with surprising felicity, and the whole work is admirably executed. Superior to Dryden's in scholarly finish, it is but little inferior in poetical merit. Best of all in Virgilian spirit and in poetical effect is the translation of William Morris (1876). Canon Thornhill's translation, in Miltonian blank verse, is extremely clever, but rather unduly expanded (Dublin, 1866).

**VIRGILIA** is a small, chiefly tropical, genus of the order *LACONISACEÆ*, named by Lamarck in compliment to the poet Virgil. The best known species, *Virgilia capensis*, a native of the Cape of Good Hope, is a handsome tree, 15 or 20 feet high, furnishing soft light wood, which is used for yokes, spars, &c. *Virgilia lutea* (separated as *Cladonia tinctoria* by some), the yellow wood, is a beautiful tree, a native of North America, growing to a height of from 30 to 40 feet, with yellowish-white fragrant flowers in loose pendulous racemes. It was introduced into England in 1812.

**VIRGILIVS (SAINT)** was born of a noble family in Ireland, and early in life crossed over to France, where he was for some time in great reputation at the court of King Pipin. Having subsequently removed to Bavaria, he got into a great quarrel with Boniface, archbishop of Mayence, about the following formula which an ignorant priest had used in baptizing:—*In nomine Patrie, et Filie, et Spiritus Sancta*. The archbishop held that all the children who had had these words said over them were not baptized at all; Virgilius maintained the contrary. In 754 the case was appealed to the judgment of Pope Zacharias, who decided in favour of Virgilius. He was soon after raised to the bishopric of Salzburg, within the jurisdiction of Boniface, and in a very short space of time erected a handsome church, which he dedicated to St. Rupert, his predecessor. But his noblest work was done among the Slavonians and Huns lying to the eastward of Salzburg. His missionary zeal was entirely praiseworthy, and he had the happiness of seeing the knowledge of Christianity spreading rapidly among his heathen neighbours. Virgilius was censured by Pope Zacharias for holding that the earth is spherical, a belief which that pontiff declared to be of the nature of heresy. He died 27th November, 780.

**VIRGIN ISLANDS** are an extensive group of small islands in the West Indies. They extend in nearly a straight line from W.S.W. to E.N.E., and occupy a space of about 100 miles in length, with an average width of 20 miles. The group consists of about 100 islands, islets, and rocks, of which probably not more than twenty-five are inhabited and cultivated. The most eastern islands belong to the British; those in the centre to Denmark; and the most western are considered as an appendage of the Spanish island of Porto Rico.

The British Virgin Islands are Tortola, Virgin, Gorda, and Anegada. Their total area is 64 square miles, and their population in 1881 was 6651. The islands of St. John and St. Thomas, formerly belonging to Denmark, were bought by the United States in 1868, but the American Senate refused to ratify the purchase. The Virgin Islands still belonging to Denmark are Santa Cruz and a considerable number of islets.

There are two rainy and two dry seasons. The climate is liable to much fluctuation in heat and winds, and is unhealthy for Europeans. They are also subject to earthquakes, and the northern shores are exposed to a very heavy swell of the sea, called "the ground sea." Besides sugar, rum, indigo, tobacco, cotton, and pease, several plants are cultivated which yield occasionally articles of exportation, as ginger, turmeric, and pimento. Roots, kitchen vegetables, and fruits are abundant. Plantains, bananas, cocoa-nuts, castor-oil plant, tamarinds, mahogany, and fustic are among the produce either of the fields or the forests. A few domestic animals are kept, but most of them are imported from the Spanish Main. There are no wild quadrupeds, and birds are rare. Salt is obtained from several lagoons, which dry up in summer.

The Virgin Islands were discovered by Columbus on his second voyage, 1494. Their subsequent history is little else than a series of struggles for them between the English, French, Dutch, and Spanish; and the existing partition has only been settled during the present century.

**VIRGINALS**, a musical instrument now entirely disused. It was a keyed instrument of one string, juck, and quill to each note, like a spinet, but in shape resembling the now defunct "square" pianoforte. The greatest compass of the virginals was from the second added line below the bass stave to the note above the second added line above the treble, or four octaves and a whole tone, but the usual compass in the sixteenth century was from G to a', three octaves and a tone. Specimens in the South Kensington Museum, of date about 1600, and of this compass (and slightly more extended) also measure 5 feet long by 16

inches wide, the case being 10 inches deep. The instrument was placed upon a table to be played. Later on the name was extended to every form of spinet. Thus Queen Elizabeth's virginals is simply a five-sided spinet. The name was sometimes said to be given it out of complement to our virgin Queen Elizabeth, but there is no doubt it was because the nuns used it in virginalizing—i.e. in singing hymns to the Virgin Mary. Queen Elizabeth was, however, rather celebrated as a clever player on the instrument. In 1564 the Scotch ambassador Melville heard her play finely, and in his quaint way records, "Then sche asked wither the queen (i.e. Mary of Scots) or sche played best. In that I gair hir the prayse." There are many allusions to the virginals in Shakespeare. The plural form, as in the case of organs—"a pair of organs," or a "pair of virginals"—no more means two instruments than a "pair of stairs" means two flights: it conveyed to the mind the ordered series of degrees on the keyboard. Occasionally the singular form "virginal" is used.

**VIRGINIA, VIRGINIUS.** When the Romans had given over the whole authority of the state to ten men (*Lat. decemviri*), who were engaged in remodelling the constitution and the laws, some of these decemvirs were disposed to use their great powers for personal purposes. The worst was Appius Claudius. At last he went so far as to declare a beautiful girl, Virginia, to be the slave of a creature of his, so as to get her into his power. Her father, Virginius, a centurion, was absent with the army, and was only able to arrive when the decision had been made. He asked permission to bid farewell to his daughter, and approaching her under this pretext he snatched a knife from a butcher's stall and plunged it in her breast. Camp and city rose to support his cause. Appius and the other decemvirs were deposed, and the consular government restored, B.C. 449. Appius Claudius died in prison while awaiting trial, probably by his own hand.

**VIRGINIA**, the commercial metropolis of Nevada, is situated among rocky ledges and ravines on the eastern slope of Mount Davidson, 15 miles N.N.E. of Carson city, and about 274 miles north-east of San Francisco. It is 6205 feet above the level of the sea. The principal streets are level, having been in many places cut through the solid native rock. The business thoroughfares are lined with blocks of substantial stone and brick buildings since a severe fire in 1875 destroyed many of the wooden structures, and the environs are adorned with many fine private residences. The population increased from 2000 in 1860 to 13,705 in 1880. This rapid growth and prosperity were owing to the rich veins of silver discovered in the famous Comstock Ledge in June, 1859. These mines, including Gold Hill, which is a mile from Virginia, are among the richest in the world, and in fifteen years produced over £30,000,000.

**VIRGINIA**, one of the thirteen original United States of North America, is bounded N. by Pennsylvania and Maryland, S. by North Carolina and Tennessee, W. by West Virginia, and E. by Maryland and the Atlantic Ocean. The area of this state in 1860 was 61,352 square miles, or 39,265,280 acres, only 11,437,821 of which were cleared; but by the separation of West Virginia in 1862 the area was reduced to 40,125 square miles. The population in 1880 was 1,512,565.

**Coast.**—The southern part of the peninsula which separates Chesapeake Bay from the Atlantic, belongs to Virginia, and is surrounded by the sea, except on the north, where it borders on Maryland. This bay is 15 miles wide at its entrance, and extends inland in a north direction about 180 miles. It is indented by many bays on both sides, and contains several islands. The larger bays are the estuaries of rivers, and constitute good harbours, admitting large vessels. The smaller bays are formed by indentations of the shores, and most of them have safe

anchorage for coasting vessels. The headlands between the bays have low and frequently swampy shores, but at some distance from them the country rises from 15 to 20 feet. That part of Virginia which lies east of Chesapeake Bay is skirted on the side of the Atlantic by many low sandy islands, which towards the north form one row, but towards Cape Charles two or three parallel rows.

**Face of the Country and Mountains.**—No state in North America presents a greater variety of surface than Virginia, from the mountains of the interior, and the rugged hills east and west of them, to the rich alluvia of the rivers and the sandy flats on the sea-coast. It has probably a greater extent of mountainous country within its limits than any state east of the Rocky Mountains, though it does not attain so great an elevation as New Hampshire and North Carolina. White Top, in Grayson county, the highest land in Virginia, is about 6000 feet above the level of the sea. The state is usually divided into four sections:—(1) The tide-water district, bordering on the Atlantic and Chesapeake Bay, is generally level, not more than 60 feet above tide, even in its highest parts. It is marshy in some districts and sandy in others, but clad with pitch-pine trees. (2) Further west is a more elevated tract, called by some the Piedmont (foot of the mountain) district. This section has fine woods, and is more varied as well as more elevated in surface than the previous one. (3) The valley district, which passes from Maryland into Virginia, near Harper's Ferry, about 50 miles north-west of Washington. This district is crossed by the different ridges of the great Appalachian chain, known by various local names, and including extensive valleys of fertile land between them. (4) The Trans-Alleghany district, lying, as its name implies, west of the mountains. This portion is most hilly and broken, or occupied with outlying spurs of the Alleghanies, and is now chiefly included in West Virginia.

The mountains extend across the middle of the state in a south-west and north-east direction, and occupy a belt of from 80 to 100 miles in width. The Blue Ridge forms the eastern barrier of the mountainous region, and the Laurel, Greenbrier, and Great Flat Top mountains the western. Between these last and the Blue Ridge lie the Great North, Short Mill, Jackson's, Peter's, Potts, Walker's, Iron, North Branch, and Cheat mountains. Next to White Top the highest summit is the Peak of Otter, about 4260 feet above the level of the sea. The Cumberland Mountains are on the boundary between Kentucky and Virginia. The valley district, generally known as the Valley of Virginia or the Shenandoah, is a table-land, elevated from 1200 to 1500 feet above the sea.

**Geology.**—A tract of the tertiary formation occupies the south-east part of Virginia, from the sea and bay coast to a line slightly diverging south-west from the north-west angle of King George county, on the Potomac, passing near Richmond, and leaving the state near the south-west angle of Brunswick county. This is succeeded by a wide belt of primary formation, reaching to the base of the Blue Ridge Mountains. Two narrow belts of new red sandstone, having the same south-west course, come to the surface in several parts of this great primary bed. West of the Blue Ridge a narrow rim of Potsdam sandstone crops out, succeeded by a zone of Black River, Birdseye, and Trenton limestone, having near the middle of it the towns of Winchester, Staunton, and Lexington. This in turn is followed by various groups (extending in the same direction to the western mountain ridge), viz. of gray sandstone, Hamilton group, including Tully limestone (this group contains shales of various colours, graywacke, pyrites, producing rock and limestone shales), Helderberg limestone, Portage and Chemung groups (flagstones, shales, and thin bedded sandstones), Medina sandstone (consisting of variegated sandstones and marl, and giving origin to brine springs), and

the carboniferous limestone. The great Pennsylvania and Ohio bituminous coal-field occupies the space between the western slope of the mountains and the Ohio River and the state of Kentucky.

**Minerals.**—Virginia is rich in minerals of the more useful sort, and in some of the precious metals. The list includes gold, copper, iron, lead, plumbago, coal, salt, gypsum (in vast beds), porcelain clay, fine granite, slate, marble, soapstone, lime, water-lime, and fire-clay. Vast fields of bituminous coal abound around Richmond, on the North Potomac, and west of the Alleghany Mountains, and large beds of anthracite are found beyond the Great Valley. An inexhaustible supply of coal also exists on the Kanawha and its tributaries, and a vein of cannel coal of considerable extent near Charleston. A great variety of mineral springs, sulphur, warm, and chalybeate, are found in the Valley district, about the middle of the state. Copious salt springs abound in the south-west. Extensive salt mines occur in the same region, and are doubtless the source of the saline springs.

**Rivers.**—Virginia has numerous navigable rivers. They all originate within the mountain region or on the ranges which form the edges of that district. The greater number run east and south-east, and flow into the Atlantic; the others north or north-west into the Ohio.

The Potomac, from its source to its mouth, forms the boundary between Maryland and Virginia. The upper branches of this river drain the northern portion of the mountain region. Its north branch, which is generally called simply the Potomac, rises in the Backbone Mountains, and it runs with many bends north east and east to its union with the south branch, which rises near 38° 30' N. lat., and runs nearly 100 miles before it joins that from the north. The united river passes through several ridges of the mountain region with numerous bends, and shortly before it issues from the mountains it is joined by the Shenandoah. This large river rises near 38° N. lat., and drains nearly the whole of the mountain region north of that parallel and between the Kittatinny chain and the Blue Ridge. It flows 130 miles before it joins the Potomac. Immediately after the junction of the two rivers the Potomac traverses the Blue Ridge by a narrow gap bounded by rocks, and enters the Atlantic slope, through which it flows south-east till it meets the tide at Georgetown, after which it becomes an estuary, which gradually opens as it approaches Chesapeake Bay, and where it mingles its waters with the Chesapeake it is 7½ miles wide. The Potomac may be navigated by the largest vessels as far as Alexandria, about 80 miles from its mouth, and by vessels drawing not more than 20 feet water to the falls, which are 13 miles above Alexandria.

The Rappahannock rises on the eastern declivity of the Blue Ridge, with two branches, which unite after a course of about 50 miles. The river then becomes navigable, but 10 miles further down it has some falls, and a short distance below them it meets the tide-water at Fredericksburg, up to which it may be navigated by vessels of considerable burden. Its course is about 160 miles.

York River originates in the South-east Mountains, with two branches, which unite after a course of about 100 miles, and form the York River, which is an estuary from 1 to 3 miles across. After a course of 39 miles it falls into Chesapeake Bay. This river is very important for navigation. It admits the largest ships to Yorktown, 12 miles from the sea, where it forms an excellent harbour. Up to the union of its two branches it has a depth of 3 fathoms, and admits coasting vessels.

The James River rises in that part of the mountain region which lies between the Alleghany Mountains and the Kittatinny chain, with two branches, which commence near 38° 30' N. lat., run for nearly 40 miles south, and then unite. The James River thus formed runs with great

rapidity south between high mountains, and turns to the east above Pattonsburg, where it is 806 feet above the sea-level. It passes through the Blue Ridge at the Balcony Falls, which impede the navigation, but are avoided by a canal about 6 miles long. At this place the level of the river is 500 feet above the sea. Below Lynchburg it turns to the north-east, and runs with great rapidity, but is navigable. Lower down the current of the river becomes more gentle till it approaches the falls above Richmond, where it descends 80 feet within 6 miles, and immediately below the falls it meets the tide. A canal connects the tide-water below and the navigable water above the falls. Below the latter the river gradually widens and becomes an estuary, and after a course of 90 miles further it merges in Chesapeake Bay. The wide expanse of its mouth, called Hampton Roads, affords a harbour for vessels of any size, but it is not safe in winter. Large vessels may sail up to Jamestown, more than 20 miles above the mouth; but beyond that there are but 15 feet of water, and only vessels of about 100 tons can proceed as far as Richmond. The direct length of this river is about 320 miles, but with the bends it is probably 500 miles. The largest of the affluents of the James River is the Appomattox, which rises at the base of the South-east Mountains, and runs about 150 miles. It is navigable to Petersburg for vessels of 100 tons. The Rappahannock and the Willis rivers are two other affluents of the James.

The upper course of the Roanoke lies within Virginia. This river rises in the mountain region, about 2000 feet above the sea-level; but at Salem, 15 miles from its source, it is only 1006 feet above it. After having passed through the Blue Ridge and the South-east Mountains, it runs E.S.E. with numerous bends until it enters North Carolina.

**Climate.**—There is necessarily, from its topography, great variety in the climate of Virginia. In the low country, near the coast, it is hot and unhealthy in summer, and bilious and intermittent fevers prevail in autumn. It is mild, however, in winter. The central or mountain counties enjoy a cool and salubrious temperature, with warm days, it is true, but the nights are cool and refreshing. West of the mountains, though some degrees cooler than on the coast in winter, the summers in parts are very hot. Spring is the pleasantest period of the year in most parts of the state.

**Soil and Productions.**—Virginia has a climate equally removed from the extremes of the north and the south; a soil with every variety, from the light sands of the south-east (favourable to the peach, sweet potato, melon, and other fruits) to the rich alluvia of the river bottoms and mountain valleys, favourable to wheat, Indian corn, tobacco, and even, in some parts, to cotton and rice; mountain pastures, capable of supporting large flocks of sheep and herds of cattle and swine; the finest harbour on the Atlantic coast; navigable rivers, abounding in shell and fin fish, furrowing her plains and valleys on the east and on the west, and affording, besides, immense water power; and with the most useful minerals in abundance. In the culture of tobacco, Virginia has always surpassed every other state, and was also the first place in which its culture was practised by civilized men to any considerable extent. It was even used for a time as the currency of the country. The vine also is now most successfully cultivated. The other great staples are Indian corn, wheat, oats, live stock, and butter. Rye, wool, pease, beans, Irish and sweet potatoes, buckwheat, fruits, market products, cheese, hay, grass-seeds, flax, maple sugar, beeswax, honey, rice, cotton, barley, wine, hops, hemp, silk, and molasses are also produced in larger or smaller quantities. Wild animals are now rare on the east side of the mountains, but they are still found in the western districts. The most common are bears, wolves, deer, the raccoon, squirrel, and opossum.

Immense numbers of oysters are caught on the coasts, and large quantities are exported.

**Manufactures, &c.**—As is generally the case in the southern states, Virginia is less engaged in manufactures than in agriculture, though the former branch of industry is yearly claiming more attention and enlisting more capital. The exports are chiefly tobacco, Indian corn, wheat, flour, coal, wool, and oysters. At Staunton are the Institution for the Deaf, Dumb, and Blind, and the Western Insane Asylum, both state institutions. The Eastern Insane Asylum is at Williamsburg, and the State Penitentiary at Richmond. General Lee, the commander-in-chief of the Confederate army during the Civil War, was, shortly after its termination, elected president of Washington College, Lexington, an institution of high standing, founded in 1781. The white population of Virginia is mainly of British origin. The Virginians have always prided themselves on their purity of descent, many of them having sprung from the old Cavalier stock; and "one of the first families of Virginia" has become a proverb in the United States. This pride does not, however, seem to carry any great tenderness in the matter of paying interest on the foreign state loans, and the stockholders have great difficulty in obtaining what is owing to them.

**History.**—Virginia, the first British settlement in North America, was discovered by John Cabot in 1497. It was taken possession of by Sir Walter Raleigh, and named in honour of the virgin-queen, Elizabeth, on the 13th of July, 1581. Fruitless attempts were made to colonize it in 1585. It was granted by charter to the London Company, and a settlement made at Jamestown, on the James River, 13th May, 1607. The planters were chiefly men of birth and fortune, with only a few labourers and mechanics, and though received by the Indians in an amicable spirit, were mostly swept away in a few months by the diseases of a damp climate, aggravated by insufficient food and hard labour. Only the energy and determination of Captain John Smith—whose name is indissolubly connected with the beautiful story of Pocahontas, the Indian chieftain's daughter—saved the young colony from destruction; and even his exertions must have failed, but for the opportune arrival of Lord Delaware in 1610, with a reinforcement of immigrants and a supply of stores and provisions. The marriage of Pocahontas, in 1613, to John Rolfe, secured the colony a close alliance with a powerful chief, and in the years of tranquillity that followed it made good its hold upon American soil. It was not until it became a crown colony in 1626, however, that its prosperity really commenced. It then increased so rapidly that in 1649 it numbered 15,000 English, mostly of good descent, and counted several thriving towns, and twenty churches. In 1742 its capital, Richmond, was founded. Soon afterwards Portsmouth grew into some importance as a safe and commodious harbour. In 1769 Thomas Jefferson, one of its representatives, claimed for the colony the privilege of self-taxation, and Virginia was foremost in the great struggle which secured the independence of the United States. It returned George Washington as its delegate to the Congress of 1774, and was the largest and most populous of the original thirteen states, or the "Old Dominion," contributing without stint its best blood, intellect, and treasure to the sacred cause. It has been called the "Mother of Presidents," four out of the five elected before 1825 having been Virginians: namely, Washington, Jefferson, Madison, and Monroe. To the American Congress it has also returned some of the members most distinguished for statesmanlike views and animated eloquence, and it has never failed to boast of its pure blood, many of its families tracing their descent from the proudest of the English Cavaliers and the most ancient of the English aristocracy. But it has always been conspicuous for its hatred of the North, and its devotion to the principle

of states' rights. When the Civil War broke out in 1861, Eastern Virginia immediately seceded from the Union (25th April), and Richmond became the capital of the Confederacy. Recognized as at once the heart and brain of the new power, the Northerners devoted their grandest efforts to its subjugation, and the valley of the Potomac was the scene of many desperate engagements, while the lines of the Shenandoah, the Rappahannock, the Chickahominy, and the Rapidan were contested with equal determination. Richmond fell, after a siege of 1452 days, on the 2nd of April, 1865, and with its surrender the entire fabric of the Confederacy collapsed.

Western Virginia refused to follow her sister in her career of secession, declared herself an independent state, nominated a governor, and was formally admitted into the Union by Act of Congress, December, 1862.

**VIRGINIA, WEST**, one of the United States of North America, is bounded on the N. by Pennsylvania and Maryland, on the S.E. by Virginia, on the S.W. by Virginia and Kentucky, and on the N.W. by Ohio. Excepting a small portion forming the northern extremity, and called the Panhandle, it lies between 37° 6' and 39° 44' N. lat., and between 77° 40' and 82° 35' W. lon. Its outline is very irregular. The greatest length from north to south is about 250 miles. The area is estimated at 21,615 square miles.

The surface is generally hilly and mountainous. The north-eastern part is traversed by the main ridge of the Alleghanies, which also form part of the boundary between the state and Virginia. The direction of the ridge is north-east and south-west. Nearly parallel with it are several ranges of mountains called the Greenbrier, the Cheat Mountains, &c. The average altitude of the summits of the Alleghanies in this state is about 2500 feet above the level of the sea. The elevation of the Greenbrier valley, which is more than 100 miles long, is stated to be 1500 feet. The motto of the state is, *Montani semper liberi*, "Mountaineers always free."

Iron, coal, salt, petroleum, and limestone are abundant in West Virginia, which is also said to contain copper, lead, nickel, and antimony. Immense beds of bituminous coal are found in the Panhandle, in the Kanawha valley, on the banks of the Monongahela, below Clark'sburg and near Cheat River. The iron of West Virginia is almost co-extensive with its coal. Rich mines of it have been opened in Preston county, in the Kanawha valley, and in other parts of the state. Large quantities of salt are procured near Charleston on the Kanawha, and in Mason county. Limestone is found in many parts of the state, and is often associated with iron and coal. Petroleum abounds in several parts, and on McFarland's Run, a tributary of the South Fork of Hughes River, is a large deposit of asphaltum, or solidified rock oil, known as the Great Vertical Asphaltum Lode.

**Rivers.**—The Ohio forms the entire western boundary of this state. It is navigable the whole distance for vessels of 30 or 40 tons burden, though there is a rapid above the mouth of the Great Kanawha, called Letart's Rapids, over which the Ohio runs for half a mile with great velocity. The state is also intersected by the Great Kanawha, and drained by the sources of the Greenbrier, the Monongahela, the Cheat River, the Guyandotte, the Elk, the Gauley, and the Little Kanawha. The Big Sandy River forms the boundary between West Virginia and Kentucky. The Great Kanawha, after crossing the southern boundary, flows in a north-west direction, and enters the Ohio at Point Pleasant. It is navigable for steamboats for nearly 100 miles from its mouth. In the upper part of its course it is called the New River. Its principal tributaries are the Greenbrier, the Gauley, and the Elk. The Greenbrier rises in the eastern part, flows south-westward, and enters the Kanawha or New River at the south-west extremity of Greenbrier county.



The climate is mild and salubrious. The mean annual temperature is said to be lower than that of any other region in the same latitude east of the Missouri River. The isothermal line, indicating the mean temperature of 52 degrees, passes near the centre of the state. The amount of rain which falls in a year is between 32 and 36 inches.

The soil is generally productive, not only in the valleys, but even on the sides and tops of the hills, which are specially adapted to pasture and sheep-feeding. The state is abundantly supplied with timber, including the oak, walnut, hickory, ash, wild cherry, tulip tree, sugar maple, &c. The staple productions are Indian corn, wheat, oats, potatoes, and butter. Large quantities of wool, petroleum, tobacco, buckwheat, maple sugar, &c., are also produced.

The northern part of the state is traversed by the Baltimore and Ohio Railway, which connects Wheeling with Baltimore, &c. The North-western Virginia Railway extends from Parkersburg, on the Ohio River, to the Baltimore and Ohio line at Grafton. According to the census of 1880, West Virginia had a population of 618,457.

The governor of West Virginia is elected for two years, and receives 2000 dollars per annum. The legislative power is vested in a senate and a house of delegates—the former consisting of twenty-two, elected for two years; and the latter of fifty-seven delegates, elected for one year.

This state formed part of Virginia until the latter seceded from the Union, April, 1861. On the 11th of June, 1861, representatives from forty counties assembled at Wheeling, protested against the act of secession, and took measures to form a provisional government. A convention met at Wheeling on the 26th of November, 1861, and framed a constitution for a new state, which was adopted by the vote of the people on the 3rd of May, 1862. An Act of Congress for the admission of the state of West Virginia into the Union was approved by the president on the 31st of December, 1862, but it is of disputed constitutionality. A large majority of the West Virginians actively supported the cause of the Federals. Slavery was abolished by the legislature on the 3rd of February, 1865. A political antagonism or jealousy had long existed between the people of West Virginia and those residing in the eastern part of the state of Virginia, from whom they were separated by the Alleghany Mountains. The latter, having control of the legislation, employed it in favour of their own section, by compelling the west to pay *pro rata* for internal improvements in Eastern Virginia, and taxing only nominally the property in slaves, which were much more numerous in the east than in the west.

**VIRGINIAN CREEPER** (*Ampelopsis hederacea*) is a shrubby climbing plant, belonging to the order VITACEÆ. It is a native of North America, and is extensively cultivated in Britain to cover walls, the fronts of houses, &c. It grows rapidly, and climbs to a great height, often as much as 50 feet or more. The beauty of its foliage in autumn, the decaying leaves exhibiting various tints of crimson, red, purple, or orange, renders it a universal favourite. The small flowers are yellowish-green, and the berries dark blue. It was introduced into England in 1629. The Virginian creeper climbs by means of tendrils, which, like those of the vine, are metamorphosed flowering shoots. These tendrils turn from the light towards the tree or wall, and on coming into contact with a support, their sensitive tips expand and form tenacious pad-like discs, which fit into crevices, while the main portion of the tendril becomes spirally coiled, thus enabling the plant to take a firm hold. It is readily cultivated in any common soil. An allied species, *Ampelopsis bipinnata*, is also cultivated in this country as an ornamental climbing plant, but does not attain the height of the Virginian creeper, and is of slower growth.

**VIRGO** (constellation), the sixth constellation in the zodiac, surrounded by Libra, Boötes, Leo, and Corvus. It is best known by two remarkable stars; the first, Spica ( $\alpha$  Virginis), a star of the first magnitude, is in the hand, which is supposed to hold ears of corn, typical of the harvest, which approached in the time of the Greeks as the sun neared this star; the other, Prævidematrix or Vindematrix ( $\epsilon$  Virginis), took its name from the vintage. The star Spica forms a remarkable triangle with Arcturus and  $\beta$  Leonis (or Denebola); and of the bright stars in this triangle, Vindematrix is the one nearest to the line joining Arcturus and  $\beta$  Leonis.

Hesiod and Aratos unite in representing Virgo to be Justice, who retired to heaven when the golden age came to an end; the former makes her the daughter of Jupiter and Themis. See PLATE CONSTELLATIONS, both hemispheres, along the margin XII. to XIV.

**VIRIATHUS** or **VIRIATUS**, the leader of the Lusitanians in Hispania, in their war with the Romans, about the middle of the second century B.C. He was originally a shepherd. When the Roman prætor Servius Galba treacherously massacred a large body of the Lusitanians (B.C. 150) Viriathus was one of the few who escaped. His enthusiasm soon brought his countrymen to revolt and carry on a vigorous guerilla warfare with the Romans. In 149 B.C. a Lusitanian army having been defeated by Caius Vetilius, the fugitives, who were blockaded, were on the point of surrendering, when Viriathus, by a skilful manœuvre, released them, and was appointed their general. In a battle which took place shortly afterwards, he defeated and killed Vetilius. In the three following years he defeated successively three prætors. In B.C. 145 the Romans sent against him the consul Q. Fabius Maximus Emilianus, who checked his successful course and obtained a treaty of peace from him. At last, in B.C. 140, the consul Q. Servilius Cæpio secured his person through the treachery of some of his friends, and put him to death.

**VIRIDIC ACID**, an acid found in coffee-beans in the form of viridate of calcium, to which the green colour is due. It is produced by the oxidation of caffeoylic acid. It is an amorphous brown powder, very soluble in water, and having the formula  $C_{14}H_{11}O_8$ . It is coloured deep green by alkalis, and dissolves in strong sulphuric acid, with a crimson colour, from which water throws down a blue precipitate.

**VIRIDINE**, one of the organic bases from coal-tar. It is soluble in alcohol and ether, but slightly soluble in water. It is a liquid, having the specific gravity of 1.017, boiling at 230° C. (446° Fahr.), and having the formula  $C_{12}H_{10}N$ .

**VIROLA** is a genus of plants established by Aublet for a few species of large tropical American trees, belonging to the order MYRISTICACEÆ; it is now generally regarded as a section of the genus Myristica. The best known species is *Myristica (Virola) sebifera*, a large tree common in the forests of Guiana and Brazil. When incisions are made into the bark, a reddish glutinous juice exudes, which, when fresh, is used as a caustic, and which concentrates in time. Within the mace is a kernel of a whitish colour, and this, when powdered and put into boiling water, yields a yellowish-coloured fatty substance which swims on the surface. It is caustic in taste, and has a slight odour of nutmeg. In the country candles are made of it. This vegetable fat or tallow is sometimes met with in commerce in square loaves.

**VIRTUAL VELOCITIES, THE PRINCIPLE OF**, is the name given to a most important generalization in mechanics, which forms the basis of all the general methods employed in the solution of problems relating to equilibrium.

By *virtual velocity* is meant the line described by the point of application of a force if the equilibrium of the system to which it is applied receive an infinitely small dis-





University of Pavia about the year 1362, and collected a considerable library. His son Gian Galeazzo married Isabella, daughter of King John of France, and his daughter Violante became the wife of Lionel, son of Edward III. of England. Galeazzo died at Pavia in 1378, and was succeeded by his son Gian Galeazzo.

Matteo had died in 1355. Barnabo continued to rule Milan and the rest of his territories till May, 1385, when Gian Galeazzo surprised him, and shut him up in the castle of Trezzo, where he died seven months after. In May, 1395, Gian Galeazzo obtained of the Emperor Wenceslas a diploma creating him Duke of Milan, and by a subsequent imperial diploma the boundaries of the duchy of Milan were defined, and made to include twenty-five towns, from Verona, Vicenza, and Belluno on the east, to Alessandria and Tortona on the west. In 1402 Gian Galeazzo was only waiting for the surrender of Florence to declare himself King of Italy, when he died of the plague.

Giovanni Maria Visconti, his eldest son, aged fourteen, was then proclaimed duke. He proved pusillanimous, suspicious, and cruel, and was murdered, 16th May, 1412.

Filippo Maria Visconti, the second son of Gian Galeazzo, was the next duke. He reigned thirty-five years, dying at Milan in 1417. His son-in-law, Francesco Sforza, succeeded him as duke of Milan. [See SFORZA, FRANCESCO.] The dynasty of the Visconti, which may be considered as having commenced with Matteo, in 1288, ended with Filippo Maria, and it constituted one of the most powerful Italian principalities of the middle ages. It was as the grandson of Valentina Visconti, sister of the two last dukes, that Louis XII. of France put forth his claim to the duchy. As it was a fif male the claim was absurd, but it was strong enough to bring the French into Italy and to cause infinite bloodshed and ruin.

**VISCOSIMETER**, an apparatus for measuring the viscosity of liquids, by comparing the time required by a given quantity to pass through a small tube compared with water. It is especially employed for viscous liquids, and for testing the value of lubricating oils.

**VISCOUNT** (Lat. *vice-comes*, Norman-French, *vis-count*), a degree or title of nobility next in rank to an earl and immediately above that of baron. It is the most recently established English title, having been first conferred by letters patent on John, Lord Beaumont, by Henry VI. in 1440. [See TITLES OF HONOUR.] The eldest son of an earl is always called by courtesy viscount. A viscount's coronet is edged with large pearls, but smaller than those of a baron, and touching one another. In heraldic drawings nine are usually shown. The mantle is scarlet, with two and a half doublings of ermine.

**VISCUM**. See MISTLETOE.

**VISHNU**. See INDIA.

**VISMIA** is a genus of plants belonging to the order HYPERICINEÆ. About fifteen species are known, trees or shrubs, chiefly confined to tropical America. *Vismia guianensis* is a small tree with a stem about 8 feet high. The bark when wounded yields a gum resin, which when dry becomes hard, and resembles gamboge both in appearance and in its powerful purgative properties, and is called American gamboge. The leaves and fruit likewise yield a similar secretion.

**VISTULA** (*Wista*, *Weichsel*). the principal river of Poland, rises in the Carpathian Mountains in Austrian Silesia, at the height of about 2000 feet above the sea, flows first north to the boundary of the province, and then turning nearly east, enters Poland and passes Cracow. Leaving this place it flows north-east, dividing Poland from Galicia as far as Sandomir, where it turns north to Warsaw, a few miles below which it takes a north-westerly course till it leaves the Polish territory and enters Prussia a little above Thorn. About 20 miles west from this town, the river flows in the direction of N.N.E. to the

Baltic. Before it reaches the sea it divides below Marienwerder into two branches, the smaller of which, called the Nogat, discharges itself into the Frische-Haff by about twenty mouths. The larger or western branch, after flowing about 40 miles further, again divides into two branches, the smaller of which turns east, and empties itself into the Frische-Haff by a new channel, which it forced for itself in 1840, and the main stream, taking the opposite direction, enters the Baltic at Weichselmunde, 3 miles north of Dantzic. The branches that enter the Frische-Haff form several deltoid islands. In its course through Poland the Vistula is joined on the left by the Nida, the Pilica, and the Bzura; on the right by the San, one of its largest affluents, which drains a considerable portion of Galicia, and enters the Vistula near Sandomir; and the Bug, the largest of all its tributaries, which also rises in Galicia, and flowing for a considerable distance along the eastern frontier of Poland, turns west, and falls into the Vistula near Warsaw, having received in its course many rivers, among others the Narew, at a short distance from its junction with the Vistula. The whole course of the Vistula is about 550 miles, and it is navigable for large barges from Cracow to the sea, but it is closed by ice from December to March. The Bromberg Canal connects it with the Oder. The Vistula, being joined with so many navigable rivers, and flowing chiefly through a level country, is a great channel for the conveyance of the corn and timber of Poland from the interior of the kingdom to the Baltic ports, especially to Dantzic. At its junction with the Bug stands the important fortress of Modlin. At Warsaw the river is commanded by Alexander's citadel.

**VISUAL PURPLE**. See RETINA.

**VITACEÆ** or **AMPELIDÆÆ** is a small order of dicotyledonous plants belonging to the series Discifloræ, cohort Celastrales. [See BOTANY.] There are about 250 species, natives of the tropical and warmer temperate parts of the world. They are rare in America and none are natives of Europe. They are trees or generally shrubs, climbing by means of tendrils, which represent flowering shoots, and are placed opposite the leaves. The leaves are alternate, stalked, simple or compound. The flowers are hermaphrodite or unisexual, in racemes, panicles, or thyrsi, usually small and greenish in colour. The calyx is small, four or five-toothed or lobed; the petals are four or five, valvate, deciduous, free or variously coherent; the stamens are four or five, opposite the petals, and springing from a disc surrounding the ovary; the ovary is two-celled, with two ovules in each cell, or three to six-celled, with a solitary ovule in each cell; the style is short or wanting. The fruit is a berry, one to six-celled, with one or two seeds in each cell. The majority of the species are contained in the genus *Vitis* (VINE), with which the genera *Ampelopsis* and *Cissus* are generally combined. The other genera are *Pterisanthes* and *Lecy*, both confined to the Old World, and containing few species. The most characteristic property of the order is acidity, the sap of the stems and leaves containing tartaric acid. The only species of much economic value are the Grape Vine (*Vitis Vinifera*) and several nearly allied American species. The VIRGINIAN CREEPER (*Ampelopsis*) is cultivated as an ornamental shrub. A colouring matter is obtained from some species of *Cissus*, and others are used medicinally.

**VITAL FORCE**. See LIFE.

**VITALIAN**, Pope, succeeded Eugenius I. in 657. Warned by the fate of Pope Martin, who in 655 had perished under the rigours of the brutal Constans, Vitalian avoided publicly condemning the *Type* or decree with which that emperor had replaced the Ekthesis, or definition of the imperial doctrine of the one will in Christ, and which the popes (save Honorius) had considered heretical, the papal doctrines demanding a human as well as a divine will in the Saviour. The *Type* of Constans sought, by pro-

hibiting all discussion of the imperial or *monothelite* doctrine under stringent penalties, to silence this long and bitter controversy. For refusing to keep silence Martin had suffered. Vitalian had to pay a yet heavier price for his dignity. The emperor, haunted by the spectre of his murdered priest-brother, Theodosius, could not rest at Byzantium. He tried to find rest in Rome; and availed himself of his sojourn to plunder the city, its churches, and secular buildings of everything valuable and portable, which he sent off to the East (even the roof of the Pantheon he tore off), the trembling Pope not daring to utter a word of protest (663). Constant away, Vitalian took courage, and stoutly sought to reduce to obedience the Archbishop of Ravenna, who had obtained independent jurisdiction from the emperor. We in England forgive Vitalian much, because of the fact that it was he who consecrated Theodore of Tarsus archbishop of Canterbury, in 668, and sent him to organize the Church of England. Vitalian died 672.

**VITALIS, ORDERICUS.** See ORDERICUS.

**VITE, TIMOTEO DELLA, or TIMOTEO VITI,** a painter, born at Urbino in 1469, was the pupil of Francia at Bologna, and the assistant of Raffaele at Rome. He was originally a jeweller, and commenced painting in 1503. He was an imitator of Raffaele in his later works, several of which are still preserved at Urbino, where he died in 1523. Timoteo's brother Pietro, also a painter, is supposed to be the *Pietro di Urbino* who, according to Baldinucci, was one of Raffaele's heirs.

**VITEBSK**, a town of Russia, the capital of the government of the same name, is situated on the Duna, at its confluence with the Vitaba, and has about 30,000 inhabitants. The part of the town on the left bank of the Duna is the most considerable; beyond the Vitaba is the old castle, surrounded with a very lofty rampart and handsome buildings. The streets are narrow and irregular, and there are only a few stone houses. One of the finest edifices is the Greek convent of St. Basil. There are several churches, monasteries, synagogues, hospitals, poor-houses, an orphan asylum, and a large bazaar. There are also some woollen manufactures and tanneries in the town, and a good trade is carried on in corn, flax, hemp, tobacco, sugar, and timber, much of it by Jews, who form a large part of the population. Vitebsk is connected by railway with Riga. The Grand duke Constantine, brother of Alexander I., died here in 1832. The town is also famous as being the place of which Napoleon remarked on his advance into Russia in 1812, "Do you think I have come so far to conquer these miserable huts?" and then changed his first determination to halt there for the winter, for which preparations had already been made, and pushed on to Moscow.

**VITELLIN**, a proteid substance, akin to myosin, &c., one of the forms of GLOBULIN. It can easily be prepared from yolk of egg, by successive quantities of ether, which abstracts the yellow matter and leaves vitellin as a residue, mixed with lecithin. The residue is dissolved in salt and water, and filtered. The filtrate is then precipitated in water, and the precipitate treated with alcohol, which removes the lecithin and coagulates the vitellin as a white granular substance, insoluble in water, but soluble in salt and water.

**VITELLIUS, AULUS**, Emperor of Rome for nearly a year in A.D. 69, was the son of Lucius Vitellius, who held the government of Syria under Caligula. Born about A.D. 15, consul in A.D. 48, and subsequently proconsular governor of Africa, Aulus was in command of the legions on the Rhine when the murder of Galba threw the imperial power at Rome into the hands of Otho. The troops under Vitellius, however, had already called their general to the sovereignty, and the struggle which followed, terminating in the defeat and suicide of his rival, gave him his brief

tenure of the throne. He did not use his triumph harshly in the first instance, but his moderation was the result of an indolent and sensual disposition, which, by neglecting the discipline of the army, and leaving the administration of the empire in the hands of rapacious officers, speedily sowed the seeds of discontent among the citizens. Love for the pleasures of the table was his ruling passion, and it is difficult to credit the stories told of his expensive entertainments and his inordinate gluttony. These habits of gross self-indulgence had their natural effects in the oppressive exactions by which the means of their gratification were provided, and in the reckless cruelties which latterly stained the name of the imperial debauchee. The standard of revolt was raised in the East, Vespasian being there proclaimed emperor; Antonius Pius in his interest led the army of the Danube into Italy; Rome was taken, and Vitellius died a miserable death—dragged from his hiding place, murdered in the streets, and his body thrown into the Tiber, December, 69.

**VITERBO**, a town of Central Italy, is pleasantly situated at the northern base of the Monte Cimino, on the highroad from Rome to Florence, 10 miles north-west from Rome, and had 19,654 inhabitants in 1882. It is a large town, and has a great number of interesting churches, several convents, and other considerable buildings; the streets are well paved, many of them with marble, and adorned with handsome fountains. In the cathedral are some good paintings, and the monuments of several popes. In it Guy de Montfort assassinated Prince Henry, nephew of Henry III. of England. The episcopal palace annexed to the cathedral is of the thirteenth century; it contains the great hall where the conclave was held, after the death of Pope Nicholas III., in 1281, which terminated in the election of Martin IV. There is a large square in the centre of the town in which the emperor, Frederick Barbarossa, humiliated himself before the English pope, Adrian IV. The population of Viterbo and its neighbourhood are supported chiefly by agriculture; there are, however, some woollen manufactures. Alum, vitriol, sulphur, and medicinal springs abound in the vicinity, and some good wine is produced.

Viterbo is supposed to occupy the site of the *Umbra Voltumna*, the place where the general assembly of the Etruscan nations was held on solemn occasions. The modern town was encircled with fortified walls by Desiderius, the last king of the Lombards.

**VITEX** is a genus of plants of the order VERVAINACEÆ. The best-known species is the Castor Tree (*Vitex Agnus castus*), a native of the south of Europe and North Africa. It is a low deciduous shrub, 5 or 6 feet in height, with opposite digitate leaves, hairy on the under surface, and whitish fragrant flowers in terminal racemes. The fruit is a globular drupe with an acrid and aromatic taste. The name is due to the idea of the ancients that the shrub possessed anti-aphrodisiac properties; and it was the practice of the Greek matrons to strew their beds with its leaves during the sacred rites of Demeter. It was introduced into England in 1570 as an ornamental shrub, and grows freely in dry soil. *Vitex arborea*, a small tree, a native of India, yields a hard and durable timber. The leaves of some of the Indian species are uncinellaginous and demulcent, and are used medicinally by the natives.

**VITORIA or VITTORIA**, the capital of the Basque province of Alava in Spain, is 26 miles S.E. from Bilbao, 156 N.N.E. from Madrid on the road to Bayonne, and has about 20,000 inhabitants. It is 1800 feet above the sea, being built on an eminence which overlooks an extensive and fruitful plain to the north; and it consists of an old and new town, which strongly contrast with each other. The streets in the former are narrow and dark, but in the latter they are well built and clean, and have a very gay and pleasant appearance. There are several handsome

public walks in the environs, and the climate is temperate and healthy. The principal square has some houses of considerable architectural pretensions, with piazzas, under which are shops and storehouses. The town-hall forms the southern side of the square, and a market is held in the open space. Among the more remarkable buildings are—the hall of the Biscayan Society; two hospitals; several churches, convents, and nunneries; public library, custom-house, orphan asylum, and a museum containing a number of Roman antiquities. The manufactures are—leather, candles, reed chairs, household furniture, copper vessels, ebony, brass and iron wares, pottery, table-linen, &c. Trade is carried on with the interior of Spain, Navarre, and Bilbao, in bar and manufactured iron, chocolate, sweetmeats, wool, cloths, silks, shoes, and hats. The French occupied Viteria from 1808 till they were driven out of it by the British, 12th June, 1813. The Anglo-Spanish army was commanded by the Duke of Wellington, and the French by King Joseph and Marshal Jourdan. Though there was not much difference in the loss of men on either side, the French were totally defeated, lost all their baggage, ammunition, and stores, and were compelled to retire from Spain.

**VITREOUS ELECTRICITY** was the old name for what we now call *positive* electricity. See **ELECTRICITY**.

**VITREOUS HUMOUR.** See **LYR**.

**VITREOUS ROCKS** (Lat. *vitrum*, glass) are more or less homogeneous glassy rocks of igneous origin, owing their peculiar character to rapid cooling. They have generally cooled at the surface of the earth, but are sometimes found forming a thin margin to dykes of igneous rock traversing other deposits. Good examples of such rocks, containing more than 60 per cent. of silica, are **ORSIDIAN**, **PLAGIOSTONE**, and **PERIDOTITE**, while tachylite is the rare representative of the less silicated vitreous rocks. **PUMICE** stone is a vesicular variety, chiefly belonging to the first group.

**VITRIFIED FORTS** are certain remarkable inclosures of stones existing in various parts of Scotland, especially in Inverness-shire. They are constructed of stones piled rudely upon one another, and firmly cemented together by some material which has been vitrified by fire, the stones themselves being also partially vitrified. They generally surround the top of some steep conical hill, and are supposed to have been intended for defensive military posts. Various hypotheses have been framed to account for the vitrified appearance of these structures, but it seems most reasonable to suppose that the material of which they are built was selected with a view to its capability of being vitrified; for the stones that have been most commonly used are granite or moorstone limestone, sandstone, and pudding stone, all of which are more or less easily fusible by fire, and the process of vitrification may have been rendered easy by the quantities of wood which in early times covered the Highlands.

**VITRIOL, OIL OF**, concentrated sulphuric acid. [See **SULPHUR**.] Vitriol is an old trade name for several glassy-looking metallic sulphates, e.g. blue vitriol is copper-sulphate, green vitriol is iron-sulphate, white vitriol is zinc-sulphate.

**VITRUVIUS POL'LIO, MARCUS**, a Roman architect well known for his work "De Architectura," in ten books. This is practically our sole technical authority for the architecture of the ancients, except what we ourselves discover by examining the ruins of their buildings. His life is known only by what he casually says of himself in his treatise. He is noticed only by two ancient writers: by the elder Pliny, who enumerates him among the writers from whom works he compiled; and by Frontinus, in his treatise on aqueducts, "De Aqueductibus," who mentions him as the inventor of the Quinarian measure. Neither the time nor the place of his birth is known, but he is generally

supposed to have been born at Formiæ (Mola di Gaeta) in Campania, from several inscriptions relating to the Vitruvian family which have been found there. As he dedicated his work to the Emperor Augustus when he was already old, and as it was written before the theatres of Marcellus and Balbus were built, which was in the year 13 B.C. (for when Vitruvius wrote, the theatre of Pompey was the only stone theatre in Rome), it follows that he must have been born about 80 B.C., or a little earlier. From what he says in the prefaces to his third and sixth books, it would seem that he was not very successful in his profession; he executed only one public work that is mentioned, a basilica at Fanum. He was, however, at the time that he wrote, one of the superintendents of the engines of war, the others being Marcus Aurelius, P. Numisius, and Cn. Cornelius. He states that he had received a good education, and was fond of literary and philosophic subjects; that riches were no object with him, and that he was possessed of very little; but that he hoped to acquire a reputation with posterity for the treatise he was then writing. He mentions in the preface to his seventh book the architectural writers to whom he was chiefly indebted for information.

There have been many editions of Vitruvius; the editio princeps was printed, without date or name of printer or place, about 1480, at Rome, by George Herolt, in folio, under the superintendence of Sulpitius. The best edition is that published by Schneider, at Leipzig, in three vols. 8vo, 1807, but it is without plates.

There are translations into French, Spanish, Italian, German, and Dutch. It was translated into English by W. Newton, in 1771-91, with plates, folio, London; by W. Wilkins, R.A., in 1812, "The Civil Architecture of Vitruvius," in two parts, 4to, being a translation of the third, fourth, fifth, and sixth books only, but the text is not entire, and the introductions are omitted; and in 1826, 8vo, by Joseph Gwilt (London; second edit., 12mo, 1860).

**VITTORIA** (in Spain). See **VITORIA**.

**VITTORIA, TOMMASO LUDOVICO DA**, was the greatest Roman musician of the early school, save the immortal Palestrina alone. He was born in Spain in 1510, came to Rome and was appointed by Gregory XIII. choir-master of the Collegium Germanicum in 1573. He was devoted to Palestrina, and followed the style of his great friend, though by no means in the way of slavish imitation. A large number of specimens from this master are fortunately readily accessible in Froese's "Musica Divina." His works, all sacred (masses, hymns, motets, &c.), are curiously full of expression for the period, closely following the sentiments of the words; in this respect fully equalling Palestrina, and some think occasionally surpassing him. Vittoria died about 1605; his last work (like Mozart's) being a superb Requiem, or funeral mass. This was for the Empress Maria, and is still most delightful to listen to—tender, consolatory, devout, and curiously modern in feeling.

**VITUS, SAINT** (Guido or Guy), whose day is the 15th June, was a Sicilian lad whom a Christian nurse converted, and who was driven out by his enraged father. He fled into Italy and became a martyr in the persecution of Diocletian, fourth century. His day long rivalled that of St. Swithun as a test of a rainy season.

An accident has made St. Vitus quite otherwise famous. A chapel near Unn, dedicated to him, acquired a reputation for the cure of a peculiar nervous or hysterical trembling, which a woman who had prayed there had become freed from. Others similarly affected thronged to the chapel to pray, let us hope successfully, but the records say little on the point. The disease became known as St. Vitus's dance, and the name quickly extended to a number of obscure ailments, all manifesting themselves in this muscular affection. See **CHOREA**.

**VIVARAIS, LE**, a province in France, formerly included in Languedoc, and lying chiefly between the Rhone

and the main ridge of the Cevennes from Mont Lozère on the south, to a little north of the town of Anouay. This portion of it now forms the department of Ardèche. The remaining part of Vivarais extended west of the Cevennes, and now forms the south of the department of Haute-Loire. The capital of the province was Viviers.

**VIVERRIDÆ** is a family of mammals belonging to the order CARNIVORA, and nearly allied to the cat family (FELIDÆ). In general the body is rather elongated, the legs short, the head somewhat conical, the muzzle often acute, the eyes oblique, and the tongue rough with pointed horny papillæ. In most groups the feet are digitigrade, in some semi-plantigrade. There are forty teeth, arranged as follows:—

$$l. \begin{array}{c} 3-3 \\ \hline 3-3 \end{array}; c. \begin{array}{c} 1-1 \\ \hline 1-1 \end{array}; pm. \begin{array}{c} 4-4 \\ \hline 4-4 \end{array}; m. \begin{array}{c} 2-2 \\ \hline 2-2 \end{array}$$

The canine teeth are smaller proportionately than in the Felidæ; and the molar teeth exhibit more or less of a tubercular character. Many are remarkable for a strongly-scented musky secretion, contained in glandular anal sacs. The Viverridæ are entirely confined to the Old World. To this family belong the genera *Viverra* (Civet, RASSE, ZIBET), *Genetta* (GENET), *Herpestes* (ICHNEUMON), *Paradoxurus*, *Arctictis*, *Cynogale*, *Cynictis*, *Crossarchus* (MANGUE), *Suricata* (SURICATE), and *Cryptoprocta*, most of which are noticed under separate headings.

**VIVIANITE** is a hydrated phosphate of iron, of a dark blue colour, often found investing bones that have been buried in the earth. Larger quantities are sometimes met with in copper and tin veins, and in beds of brown iron ore; and an earthy variety is commonly known as Native Prussian Blue.

**VIVIPAROUS** (Lat. *vivus*, alive, and *parere*, to bring forth), in zoology, is a term applied to those animals which bring forth their young in a living and more or less perfect condition, the embryos being developed in the ovary or a dilated portion of the oviduct. Animals are sometimes loosely said to be viviparous when the young are born alive through the rupture of the egg-shell before extrusion. This is more properly a condition of oviparity, and such animals are said to be **OVOVIVIPAROUS**. All mammals are viviparous, except the Monotremes, which are oviparous; and true viviparity occurs also among some fishes and in a few insects. See **Oviparous**.

**VIVISECTION** is the name given to the art and practice of experimenting upon living animals for the purpose of physiological study and medical research. It may be traced back to the early periods of the study of medicine and surgery, and it was largely practised by the members of the medical schools of Alexandria. It has always been considered one of the resources of the physiologist, but it is only during the present century that the custom has assumed extensive proportions, or has given rise to legislative enactment and a fierce and bitter public controversy. In Great Britain public attention was first called to the subject by the publication of the works of Brachet, Magendie, Claude Bernard, and other distinguished continental physiologists, in which accounts were given of wholesale experiments upon living animals, the majority of which entailed horrible torture upon the unhappy victims. From the writings of the continental vivisectionists it was evident that they entertained a total disregard for animal suffering, and considered themselves to be at perfect liberty to inflict any amount of torture upon animals, and to repeat painful experiments for class demonstration, &c., whenever it was considered desirable to do so. It was known that vivisection was practised in the English schools of medicine, and that the practice was defended by eminent British scientists and professors of medicine, and an agitation arose against the practice, which resulted in 1875 in the appointment

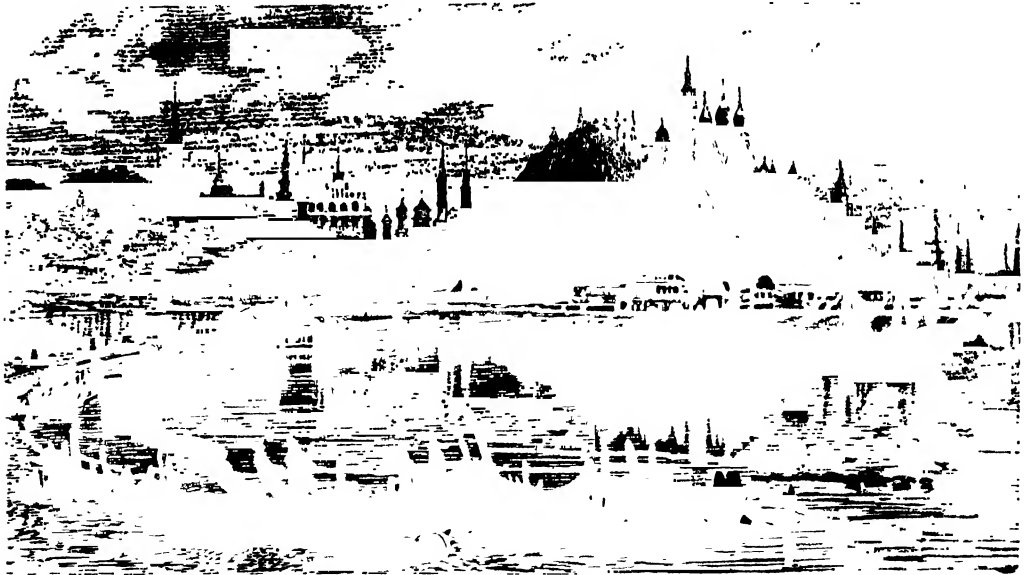
of a Royal Commission for the investigation of the subject. The commission insured respect from the high position and ability of its members, and in the course of its inquiry, which lasted over several months, witnesses of the highest eminence in physiology, medicine, and surgery were examined in relation to the subject, and the report of the sittings, &c., constitutes a large volume of information and testimony upon the subject. One result of this inquiry was the passing of the Vivisection Act in 1876 (39 and 40 Vict. c. 77). By the provisions of this Act painful experiments upon animals are only permitted when performed with a view to the advancement by new discovery of physiological knowledge, or knowledge useful for saving or prolonging life, or alleviating suffering. Only persons who have obtained official license from one of her Majesty's secretaries of state may practise vivisection, and they are required to use anesthetics during their operations, and if they inflict such injury as will cause lasting pain, to kill the animal before it recovers from the influence of the anæsthetic. Experiments involving pain to living animals are forbidden as illustrations to medical or physiological lectures, nor may they be practised for the purpose of attaining manual skill. The penalties for infringement of the Act are a fine of £50 for the first offence, and of £100, or imprisonment for three months, for second and subsequent offences. Laboratories where vivisection is carried on are inspected by government inspectors, and experimenters are required to prepare returns of the experiments they make.

With respect to the lawfulness of the practice of vivisection, very great difference of opinion exists, and the controversy between its defenders and their opponents is waged with much animation, and with a great deal of feeling on both sides. In defence of vivisection it is urged that to it we are indebted for nearly all our present knowledge of physiology. Anatomy, or the structure of animals, may be studied upon the dead, but physiology, or the study of life and life-actions, must be studied upon the living. Thus the great truth of the circulation of the blood was discovered by means of vivisection, and nearly the whole of our present knowledge of the functions of the nervous system has been obtained in the same way, nor would it have been possible to obtain this knowledge by any other means. It is universally admitted that our present knowledge of physiology is very limited and imperfect, and it is urged that to forbid vivisection would be to prevent altogether the growth of that most important science. Again, it is pointed out that experiments upon animals have resulted in important additions to our stock of medical knowledge, and in this way a large amount of human suffering has been prevented. The treatment of anæmism by ligature, introduced by John Hunter, was worked out by means of experiments on living animals, and the study of anesthetics was largely assisted by similar methods of working. Vivisection has also afforded means of studying, with important practical results, the action of various forms of electricity upon the animal body, and consequently of making an intelligent application of this agent in the treatment of disease, and further illustrations of its value are to be found in the light it has thrown upon the functions of the liver, upon the nature of lung and heart diseases, and also upon the action of drugs upon the system, as in the case of digitalis, bromide of ethyl, &c. To sum up the case in favour of the necessity of vivisection, we may quote the words of Professor Michael Foster concerning its past influence:—"Take away from the art of medicine all that with which physiology has enriched it; and the surgeon or the physician would be little better than a mystery man, or a quack vendor of chance-gotten drugs. Take out of the present system of physiology all that has been gained by experiments on living animals, and the whole structure would collapse, leaving nothing beyond

a few isolated facts of human experience;" while Dr. H. C. Wood, a celebrated American physiologist, asserts concerning its present necessity—"The continued progress of medical science is alone possible through vivisection, and without it our medical knowledge, except in certain special directions, would become as crystalline as that of the Chinese." While contending, however, for the necessity of vivisection, most British physiologists admit that it should only be carried out by sufficiently qualified experimenters, and for definite objects; that all experiments should be conducted with the smallest possible amount of pain; that they should never be resorted to for the purpose of confirming facts already fully established; and that repetitions of experiments for class purposes are unnecessary, and ought to be avoided.

On the other side it is urged that the benefits and additions to our knowledge gained by the practice of vivisection are far less than its defenders assert, and some extreme opponents of vivisection go so far as to assert that its influence has been hurtful and pernicious, rather than beneficial to the study of medicine. In defence of this position they refer to the admissions made by some of the

most eminent of the defenders of the practice when examined as witnesses by the royal commission referred to. It is also asserted that when vivisection is practised, habitual familiarity with the infliction of pain upon animals has a decided tendency to engender a careless indifference regarding suffering, the passive impressions produced by the sight of suffering growing weaker, while the habit and pleasure of experimenting grow stronger by repetition. That there is much truth in this objection can hardly be denied. The experiments of Magendie, Brachet, and many others who have practised vivisection show that these men at best were totally indifferent to the amount of torture they inflicted, even if, as seems but too possible, they did not find a pleasure in the exercise of cruelty and the infliction of suffering. The royal commissioners in their report observe, "It is not to be doubted that inhumanity may be found in persons of very high position as physiologists," and one witness before the commission, Dr. Klein, admitted "he had no regard at all" to the sufferings of the animals he experimented upon, and that he never used anaesthetics unless it was for his own convenience. It must also be a matter of grave doubt whether men who are absolutely



Vladimir.

callous to animal suffering, or who find pleasure in inflicting it, will be likely to stop short when they come to deal with human beings, or whether their passion for experiment might not carry them into higher regions.

In the foregoing we have only indicated in bare outline the subject under consideration, but further information may be found in the report of the royal commission of 1875, already referred to; in the works of the physiologists who have practised vivisection, such as Magendie, Brachet, Claude Bernard, Brown Séquard, A. Flint, jun., J. C. Dalton, and others; in the essays on vivisection, published by the Royal Society for the Prevention of Cruelty to Animals, and in the publications of the Anti-Vivisection Society.

**VIZIR** (Arab, *ṣarīf*, he who bears a burden), a title given to the ministers of the Ottoman Porte and other sultanas. It is said to have been applied to the lieutenant of the caliph as early as 759 A.D., but the first officer of that name among the Ottoman Turks was Ala-ed-Din, who was appointed in 1326 to that position by his brother, the Sultan Orkhan. There was originally only

one officer who bore this title, but the number was afterwards increased, so that the prime minister was styled *vizir azim*, grand vizir, and the title of vizir was given to the members of his divan and to the governors of Roumelia, Anatolia, Damascus, and Cairo, as well as to the four high judges, the grand equerry, the *sirdar* or field-marshal, and others. The grand vizir is the highest officer in the empire, and as the representative of the sultan, he presides over the divan, commands the centre of the army in battle, and is the only subject who is saluted with the *allâh*, a kind of benediction. He receives from the sultan a seal, which he is obliged to wear always upon his bosom, and by the authority of which he commands obedience. In 1877 the title of grand vizir was abolished, but it has since been revived.

**VLADIMIR**, a town of Russia, the capital of a government of the same name, built on a group of hills in a fertile plain, on the left bank of the Kliuzna. It has 18,000 inhabitants, including many Jews. There are still some remains of the fortifications, but with the exception of its numerous churches and stone houses, Vladimir has now few

other traces of its former greatness. The city is large, but ill built, and has six gates, terminating the six principal streets. Of the numerous churches, the cathedrals of St. Mary and Demetrius are remarkable in the history of Russia. There are two convents, an ecclesiastical seminary, and several government buildings. The town is the see of the bishop of Vladimir and Susdal. The manufactures are cotton, linen, silk, leather, and soap. There is also a trade in corn and cherries, the latter being grown in the neighbourhood in very large quantities. Vladimir is 120 miles E.N.E. from Moscow, and the road between the two cities is through a succession of populous villages. They are also connected by railway. Vladimir was the capital of the grand-duchy of Russia from 1157 till 1328, when that distinction was transferred to Moscow.

**VLADIVOSTOCK**, a small town and seaport of Asiatic Russia, near the southern extremity of the Primorsk or maritime district of East Siberia, on the Sea of Japan. It has a safe and capacious harbour, with dockyards, barracks, &c.; and is the terminus of the overland telegraph line from Northern Europe.

**VOCAL CHORDS.** See LARYNX.

**VOCALIZATION** is the art of singing passages of music upon one vowel, as distinguished from singing notes to separate syllables. The main things to be aimed at are, first, the absolute purity of the vowel sound, and its unchangeable production all along the passage; and secondly, the steady emission of tone upon each note, the passage from one note to the other being by a very rapid glide or *portamento*, not by a jump or division, although a careless hearer might not readily detect the exact difference. The difference in the effect produced, however, is apparent to every one, a perfectly vocalized run being an absolutely continuous flow of sound, and ranking among the greatest glories of the singer's art.

**VOCE DI PETTO, VOCE DI TESTA** (chest voice, head voice), respectively the lower and upper parts of every human voice. See VOICE.

**VOCHYSIA'CEÆ** is a small order of plants belonging to the group Polypetales, cohort Polygalinæ. [See BOTANY.] The species are all natives of equinoctial America, where they are found inhabiting ancient forests, the banks of streams, and sometimes the sides of mountains to a very considerable elevation. They are generally large trees with a copious resinous juice, some yielding a hard timber. Some are erect or climbing shrubs. The leaves are opposite or whorled, shortly stalked, coriaceous and entire, with stipules or glands at the base. The flowers are perfect, irregular, often very showy. The sepals are five, free or connate at the base, usually unequal, the posterior being the largest; the petals are one, three, or rarely five, and clawed; the stamens are one to five, usually only one fertile, and perigynous; the ovary is free, one to three-celled.

**VO'GEL, EDUARD**, a German traveller and astronomer, was born at Crefeld, Prussia, 7th March, 1829. He was the son of Johann Karl Christoph Vogel, celebrated for his labours in the cause of education, and afterwards director of the public school at Leipzig, and his sister has a place as a novelist in German literature under the name of Elise Polko. Devoting himself to astronomy he studied at Berlin under Encke, and was attached for two years to Bishop's Observatory at Regent's Park, London, where he assisted Hind in his discoveries. In 1852 he volunteered his services in connection with an expedition, designed to co-operate with Barth and Overweg in Central Africa, for the purpose of making scientific observations, and for this purpose he left London, accompanied by two volunteers from the corps of sappers and miners, and taking with him a full supply of instruments. He reached Moorook in Fezzan in August, 1853, visited Lake Tchad in January, 1854, and proceeding by way of Kuka on 1st December,

1854, he met Barth at Boondi, 230 miles west of that place. He subsequently visited Yakuba, crossed the Tchadda in April, 1855, and before the close of the year he had penetrated into the kingdom of Wadai, where he was made prisoner. After being detained for some time he was beleagued by order of the Sultan of Wadai, probably in the beginning of February, 1856. In the belief that he might be still alive several expeditions were undertaken in search of him, the most noteworthy of which was that of Von Heuglin in 1860. See "Erinnerungen an einen Verschollenen," by his sister, Elise Polko (Leipzig, 1863).

**VO'GLER, ABBÉ**. Georg Josef Vogler, the beloved teacher of Weber, of Meyerbeer, of Günsbacher, Winter, Gottfried Weber, and crowds of less distinguished musicians, was a very remarkable man, and had great influence on the development of music. He was the son of a violin-maker and was born at Würzburg in 1749, and as a boy was so ardently devoted to music that his constant practising was a serious inconvenience in the house. He taught himself the violin and other instruments, and became noted as an organist. A ballet which he wrote at the age of twelve was so good that the Elector of Mainz sent him to Bologna to study under Martini. But Vogler soon left his teacher, went to Rome and took orders (1773). He gained many honours and decorations at Rome, and returning with this fame to Mannheim was appointed court music director there, the orchestra being then the finest in Europe. Vogler now founded an important teaching school. He was called away to Darmstadt by the prince in 1778; and then we hear of him in Sweden, Denmark, Holland, England, Spain, France, Greece, Africa, Armenia, and even in Greenland. Everywhere he seems to have gained a hearing for his remarkable inventions and his musical theories, but he apparently could not settle down; it is not known from what cause. Eventually at Vienna, in 1804, Weber and Günsbacher became his pupils, and his famous school began to grow up round him. In 1807 he removed to the country of his old patron, now the reigning Duke of Hesse-Darmstadt, and was appointed music director and paymaster-councillor. Possibly no teacher ever had so many remarkable pupils, and certainly none was ever so much loved. Each morning after he had said Mass all the pupils met for a lesson in counterpoint. Then subjects were given out, and later on compositions on the subjects were received and examined, all the pupils freely joining in the criticism of each other. Finally, every day at least one composition by a great master was thoroughly analyzed. Vogler died amidst universal regret in 1814.

Weber speaks of the wonderful organ playing of Vogler, possibly the best player of his day. He could stretch two octaves, it is said, so large were his hands. He was a great theorist in organ building, quite reformed the system of mixture stops, and made other really valuable alterations. He introduced organ pedals into England, where they had not been previously known. His use of free-reeds has not, however, prevailed. In harmony he was equally daring, and taught a system peculiarly like a prophecy of that which in our time Dr. Day perfected, and the late Sir George Macfarren popularized, the system which, as being the only really philosophical one, and based upon natural facts, has been adopted in the present work. Vogler's operas have now all died out, and his church music is but little heard. It is very clever, but lacks the touch of genius. His real career was as a theorist, a performer, and above all a teacher. Browning has a curious and very fine poem upon "Abt Vogler."

**VOICE.** The voice (from the Latin *vox*) is an audible sound produced in the LARYNX. For an account of the voice-producing mechanism, see that article.

*Song-voice.*—The scale of the human voice, from the lowest note of the bass to the highest of the soprano, within which limits composers write vocal music, is four



octaves—viz., from E below the bass stave to  $e''$  above the treble stave. There have been instances, but they are very rare, of voices capable of descending lower, and others of ascending higher than those limits. This scale of sounds is divided into *voce maschile* ("male voice"), which extends from E to pitch C ( $e'$  in the midst of the treble stave), and *voce femminile* ("female voice"), which extends from bass F ( $f'$ ) in the bass stave to  $e''$  above the treble stave.

The lower or male voice part of the scale is subdivided into bass and tenor, each containing two octaves; the bass extends from  $e$  to  $e'$ ; and the tenor from  $e$  to  $e''$ .

The upper or female voice part of the scale is subdivided into contralto and soprano, each also containing two octaves. The contralto extends from  $f'$  to  $f''$ , and the soprano from  $e'$  to  $e''$ .

These are the four scales within which musicians compose vocal music for each class of voice.

Intermediate between the bass and tenor is another male voice, extending from A to  $f'$ , and termed the baritone. Between the contralto and the soprano also is another female voice, extending from  $a$  to  $a''$ , and termed the mezzo-soprano. The voices of boys are classed with those of females.

It is thus obvious that the scales of the several voices overlap each other in the great compass of the human voice. The tenor descends to within six notes as low as the bass; while the bass ascends to within five notes as high as the tenor. Therefore ten notes are common to both bass and tenor, and any music whose variations of pitch are within the range of these ten notes can be sung either by a tenor or a bass voice. But the effect would be very different. The same notes would be low and sweet if sung by a tenor or in the lower part of his voice, which would be brilliant, perhaps screaming, in the highest part of the bass voice. A tenor reaches to within four notes as high as the contralto compass, and midway up the soprano, having twelve notes common to the tenor and contralto voices, and eight notes common to the tenor and soprano scales, which explains the wide variety of music which tenor voices can sing.

In dividing the range of the human voice into the four main scales, as above, it is not intended to assert that most voices will possess the full compass of any one of them—but only that they are classifiable under these extended limits. The ordinary compass of a voice is, in fact, about twelve notes, or an octave and a half. Many singers' voices, however, extend to two octaves, some even beyond two, and a very few have reached three octaves. Catalani is said to have contained three and a half octaves.

The compass of soprano and some other voices is divided into registers, of which there are two—viz., the natural and the falsetto. The former is termed in the Italian school *voce di petto*, or "chest voice;" and the latter *voce di testa*, or "head voice." To these the Italians add another which joins the two registers, and which somewhat partakes of the character of both; it is named the *mezzo falsetto*, or "middle falsetto." Each person's voice has a distinct quality of tone (*timbre* of French authors), by which it is recognized, even when singing in harmony with others.

The song note is a musical sound of some fixed pitch in the scale. When a clear resonant voice produces it, the accompanying superior partial tones to the prime may be heard just as with the sound of a vibrating string. See *Acoustics*.

*Speech-note*.—The speech-note is not a true musical sound, because its pitch varies throughout its duration. These notes are termed slides, accents, and inflections; and they may be imitated on the violin by sliding a finger up the finger-board while the bow is moving across the string. The notes may have an ascending or descending

course in pitch, and sometimes they have both on a syllable. The varying pitch of a speech-note will be illustrated if the reader, with an intense feeling of inquiry, utter aloud Hamlet's interrogatory, "Pale, or red?" The speech-note on the word "pale" will consist of an upward movement of the voice; while that on "red" will be a downward movement, and in both words the voice will traverse so wide an interval of pitch as to be conspicuous to ordinary ears; while the cultivated perception of the musician will detect the voice moving through a less interval of pitch while he is uttering the word "or" of the same sentence. He who can record in musical notation the sounds which he hears, will perceive the musical interval traversed in these vocal movements, and the place also of these speech-notes on the musical staff.

Several of the rhetoricians of antiquity speak of the changes of pitch of the voice seldom exceeding a fifth on any one syllable. This is true, though higher intervals are used, even up to the octave, but very sparingly, and the fifth itself is of less common occurrence in oratory than the third.

Speech melodies seldom exceed the limits of an octave and a half. Whatever the speaker's keynote may be, he seldom rises more than a fifth above it, or descends more than a fifth below it in pitch. A person's keynote is generally somewhat below the middle of his compass, which circumstance enables most speakers to ascend an octave if required for the purpose of expression. It will be remembered that Tiberius Gracchus, the eminent Roman statesman, used to have a flute-player near him when delivering one of his grand public orations, so as to guide him in pitching his voice exactly so as to produce the effects he desired.

The voice, whether united or not with verbal language, is expressive of the feelings. It is the language of the feelings, by which they manifest themselves to the ear without previous teaching; and when heard, are recognized and felt without teaching. The scream of terror, the shout of joy, the laugh of satisfaction, of sarcasm, or of ridicule, are made by man, and understood by his fellow-man, wherever the one may be born, or whatever may be the speech of the other. The voice is a natural and universal language. Each mental attribute has its voice, which is in relation to that attribute; and whether that attribute forms part of the mind of man or brute, it instantly recognizes the voice. The changes of pitch present the most remarkable changes in the voice; and on these mainly depend the expression of the feelings. The mind adopts changes of pitch to express its condition, and the interval of music is but a means of measuring, and thence imitating, that expression. A higher intensity of feeling increases the interval, a fact well known to composers, who have hugely availed themselves of it in dramatic music. The pages of Handel, Mozart, Beethoven, Weber, and Rossini are full of illustrations of it. The "Messiah," the greatest of all musical compositions, abounds with degrees of intensity of the same feeling.

The best of several recent excellent books on the voice is "The Hygiene of the Vocal Organs," by the celebrated throat surgeon, Sir Morell Mackenzie (London, 1886). Of "singing-methods" there is a never-ceasing supply, and there is no need to particularize any one here; the more especially as singing is an art which cannot be acquired by books, but only at the hands of a competent master.

**VOICING** (of organ pipes) is the term which is given to the methods whereby particular qualities of tone are given to particular varieties of stops, by regulating the supply of wind, the angle at which it strikes the lip, the shaping of the lip, the cutting of the mouth, &c. In reed-pipes the shape and thickness of the tongue, and its exact adjustment and manipulation, have to be added. All this is the part of the "voicer," and is necessary work,

even if the pipes themselves are already absolutely perfect in manufacture. Evenness and purity of voicing are very rare qualities in an organ.

**VOITURE, VINCENT**, an important figure in French literature, was born at Amiens in 1598. His father was a wine merchant, but an attendant upon the court, and known to all the principal people there. Voiture himself was educated at Paris. At the College de Boncourt he made the acquaintance of M. d'Avaux, who afterwards, when he became superintendent of the finances, gave his friend the valuable place of one of his first clerks. Voiture soon became distinguished at court; and he spent the rest of his life in the society of the great, occasionally visiting foreign countries on some court mission. He was elected a member of the French Academy in 1634, and of that of the Umoristi at Rome in 1638. He died in 1648.

Immensely popular in the *salons* as were his poems and letters, Voiture printed practically nothing in his lifetime; but his writings were collected after his death, and published at Paris in 1650; and they have since been often reprinted. Best edition by Ubicini (Paris, 1855). They consist of letters, poems, and a portion of a prose romance entitled "*L'Histoire d'Acidalis et de Zolide*." The importance of Voiture's work is its exquisite finish. To him and Balzac the perfecting of French as a means of precise and elegant expression of thought is largely to be attributed. His matter is rarely good, and often his best pieces are the most frivolous. The best example of Voiture is, in fact, the absolutely perfect and apparently modern "*Ma foi, c'est fait de moi*," which is entirely made up of an account of the poet's difficulties with his rhymes, till amidst his struggle he suddenly discovers "*Ma foi, c'est fait*"—the task is done. The easy trifling of the piece is, of course, on the surface; for the structure of the rondeau is most difficult and intricate, and so exquisite a specimen must have cost endless polish. But the polish thus wasted by Voiture was to prove of infinite glory in the hands of the great poets and writers of the Louis Quatorze era.

**VOIX CÉLESTE** (or *Vox Angelica*), a stop on the organ or harmonium made up of two sets of pipes or reeds of like pitch, one of which is tuned a wave sharp to the other, so that the tone instead of being steady beats slowly or waves. Hence the name *Unda Maris* (wave of the sea) has been sometimes applied to the stop. It is effective if rarely used, but readily becomes vulgar, because after a few moments the ear perceives that the stop is out of tune within itself, and refuses to take pleasure in it. Of course it is purely a solo stop, and is quite unavailable for harmony. The term is also used in the plural (*Voix célestes*).

**VOLCANIC ROCKS.** The older geologists divided the igneous rocks into three groups, according to the conditions under which they appeared to have cooled. Those that were completely crystalline (e.g. granite), and had evidently consolidated at great depths, were termed **PLUTONIC ROCKS**; others, like certain basalts which seemed to have cooled under slight pressure, belonged to the **TRAPPEAN** group [see TRAP]; while those that could be unhesitatingly regarded as having cooled in the open air were termed **volcanic**.

**VOLCANO** (Lat. *Vulcanus*, the god of fire, a name closely allied to the Sanskrit *ulka*, a firebrand) is a fissure in the earth's surface whence steam, ashes, scoriæ, melted rocks or lava, and mud are violently ejected. The smithy of Vulcanus was held to be under the Island of Lipari, and the cone of Vulcanus was its chimney. Hence our name for this class of natural phenomena. In like manner, the fires of Etna were due to the manufacture of the thunderbolts of Zeus by the Kuklôpes, and its noises and movements to the groans and struggles of the buried monster, Tupaôn.

A volcano, in old-fashioned books, is described, in far other terms, as a "burning mountain, from the summit of

which issue smoke and flames." This description is incorrect in every one of its statements. For, to use the words of a recent writer on the subject—"In the first place, the action which takes place at volcanos is not 'burning' or combustion, and bears, indeed, no relation whatever to that well-known process. Nor are volcanos necessarily 'mountains' at all; essentially they are just the reverse, viz. holes in the earth's crust, or outer portion, by means of which a communication is kept up between the surface and the interior of our globe. When mountains do exist at centres of volcanic activity they are simply the heaps of materials thrown out of these holes, and must, therefore, be regarded not as the causes, but as the consequences of volcanic action. Neither does this action always take place at the 'summits' of volcanic mountains when such exist, for eruptions occur quite as frequently on their sides or at their base. That, too, which popular fancy regards as 'smoke' is really condensing steam or watery vapour, and the supposed raging 'flames' are nothing more than the glowing light of a mass of molten material reflected from the vapour clouds."

The great conical volcanic mountains, of which there are from 300 to 350 of important size (of smaller ones the name is legion), were not made like ordinary mountains, but have been formed by the materials ejected from volcanic vents in the crust of the earth. One such, known as the Monte Nuovo, in the Bay of Naples, was formed only three and a half centuries ago. It stands 140 feet above the level of the Mediterranean, and covers an area of more than half a mile in diameter. For two years the country round had been affected by earthquakes, which gradually increased in intensity, and attained their climax in September, 1538. On the 27th and 28th of that month these earthquake-shocks were felt almost continuously day and night. On the 29th a depression of the ground was noticed, and from this depression water, which was at first cold and afterwards tepid, began to issue. Four hours later the ground was seen to swell up and open, forming a gaping fissure, within which incandescent matter was visible. From this fissure numerous masses of stone, some of them "as large as an ox," with vast quantities of pumice and mud, were thrown up to a great height, and these falling upon the sides of the vent, formed a great mound. This continued for two days and nights, and on the third day a considerable hill had been built up by the falling fragments; the ejections continued for a few more days; but the bulk of the hill had been formed by the ejections of the first two days, and it is found to be entirely composed of volcanic scoriæ, lapilli, and dust, and is now covered with thickets of stone-pine.

The circumstances attending the formation of this remarkable hill may be regarded as typical of what has taken place in the case of probably every centre of volcanic action that exists. The presence of internal disturbing agencies is first notified by successive earthquake-shocks, which result in the partial disruption of the surface and the opening out of a fissure, from which, along with heated water or steam, masses of rock, mud, and other *débris* are ejected. The materials being shot out fall in a conical heap round the opening, the slope of which is the angle of rest, just as we see in an ordinary railway embankment when the earth is shot from the railway waggons. As the materials form an inward, as well as an outward slope, the cone will have a crater (Gr. *kratêr*, cup) or cup-like depression at its summit. Within this crater incandescent matter is visible, which from time to time bursts or boils up with great eruptive force, sending forth immense volumes of heated vapour, and ejecting fresh masses of loose materials, which, as they fall back upon the newly-formed conical hill, and roll down its sides till they reach the angle of rest, gradually add to its height and swell out its bulk. Thus what had been but a short time before a level valley, or even, as in the

case of Monte Nuovo, a lake, is now an elevated hill, with all the strange and striking characteristics of a "burning mountain."

In the early period of a volcano's existence, and under normal atmospheric conditions, the cone round the crater is built up pretty equally on all sides, whereby the opening of the volcano continues to retain its original central position. But there are various agencies by which the shape of the volcanic cone is modified and changed. For instance, in the case of high mountains, such as Vesuvius, the combined weight and pressure of the material that surrounds or falls back into the opening of the crater has a tendency to plug up the opening altogether, in which event the subterranean forces frequently burst out by an opening which they make for themselves in the lower slopes of the hill. When this occurs the same phenomena happen as before. The debris thrown out falls back round the new-made opening or fissure, and a twin volcano—or "parasitic cone," as it is termed—is gradually formed. Again, when the volcano, either during an eruption or from its geographical position, is exposed to strong winds blowing persistently in one direction, the greater portion of the dust and debris ejected into the air is carried to leeward, and thus the cone is built up with the crater on one side, the summit of the cone so formed being frequently much higher than the crater, and in a sense overlooking it. Of perfect cones those of Cotopaxi, 19,600 feet, and Citlaltrepetl (Plate III.), 17,370 feet, are striking examples, though in each case we may take it that successive periods of eruption alternating with periods of quiescence have frequently changed both the size and the shape of the respective craters. But when the ejecta of a volcano are principally fluid, the shape of its cone is proportionally modified, as is most remarkably exemplified in the case of the island of Hawaii, which, as will be seen later on in this article, is one vast volcano, of which the slope is so gentle (6 degrees) as to be hardly perceptible, and where the most active crater, Kilauea, is not upon a summit, but in a deep hole.

Volcanology really dates from Spallanzani. Previous to him observers of volcanoes rather described than investigated. Moreover the earlier volcanologists did not go to work in the right way; they either watched, necessarily at a distance, some grand paroxysmal outburst, or they visited the scene of its action when the main effects had died out. Spallanzani did otherwise. He chose as the source of his observations in 1788 an ever-active volcano, which neither approaches the paroxysmal violence of Etna, Hekla, and Vesuvius during their great eruptions, nor ever sinks to the quasi-dormant condition which a volcano commonly presents. Stromboli has been active for more than 2000 years, and so moderately active that the scene of its operations can be closely approached, and from a projection which is situated a little above the crater, the observer may sit for hours when the steam and vapours are blown out to sea, and watch the phenomena which are taking place within the crater. Spallanzani did this, and for the first time realized and enunciated the important fact that volcanic phenomena are mainly, if not entirely, due to the violent escape of steam and other gases at high pressure from molten matter.

In 1871 Professor J. W. Judd (later on the president of the Geological Society), already an accomplished disciple of Powell Stroppe (whose treatise on the subject, published in 1825, was the first noteworthy work on scientific lines dealing with volcanoes), visited Stromboli, and minutely examined, from the vent to the ground first occupied by Spallanzani, the operations taking place upon the floor of its crater. He divided them into three classes. From certain large apertures in the floor steam escaped in loud, irregular puffs; within some lava could be seen, which at intervals rose and swelled out at the same time emitting large volumes of steam; while within the depths of other openings viscous

molten matter was seen to be heaving up and down, and violently agitated, like boiling water. Ever and anon, as the agitation increased, a great bubble of lava would swell out and suddenly burst, emitting steam at high pressure, the force of which hurled the red-hot scum high into the air. Thus the three essential conditions for the production of volcanic phenomena appear to be—(1) apertures or fissures affording communication with the interior of the earth; (2) highly-heated matter beneath the surface; and (3) subterranean water, which, in the form of high-pressure steam, is competent to produce all the crater operations. A mass of lava within a small active crater precisely resembles a boiling fluid. The viscous seething mass of lava within the *bocca* contains water entangled in its mass, and when this rises to the upper part of the column of lava it is relieved from pressure, and flashes explosively into steam. This restores equilibrium for a while, during which more steam is being generated, and presently another outburst occurs. The pressure of the steam which thus accumulates may be judged of by the fact that, during the eruption of Vesuvius in 1872, masses of vapour (and, it is said, fragments of scoria) were projected to a height of nearly 4 miles. The friction of this steam against the rock-masses generates enormous quantities of electricity, which appear as flashes of lightning issuing from the column of steam above the crater.

In fact, it may be regarded as true of volcanoes in general that the cause of eruptions in every instance is the escape of steam in the midst of incandescent liquefied rock—the grandeur of an eruption depending on the abundance and tension of the escaping steam. At night it will be readily imagined that the appearance of a volcano is even more striking than by day. All the openings glow with a ruddy light, and the liquid matter is red or white-hot, while the crust that forms upon it is of a dull red. When a bubble bursts, and the crust is broken up by the escape of steam, a fresh glowing surface of the incandescent material is exposed. At such moments the vapour-cloud overhanging the mountain is lit up with a vivid light, not unlike that seen on the stream of vapour from the funnel of a locomotive when the engine-driver suddenly opens the door of his furnace. The most characteristic product of a volcano is molten rock or lava. Cooled lava in appearance is very like the slag of our furnaces. It differs largely in chemical composition, and still more in molecular arrangement. As to its chemical composition, all lava is made up of oxides, so that half its weight is oxygen, and of these oxides silica is so far the most abundant (from 40 to 80 per cent. of the total mass) that the metalloid silicon forms a quarter of the total weight, and of the remaining quarter something less than half is due to the metal aluminium. Where silica forms over two-thirds of the mass of lava it is called an *acid* lava; where silica is in less proportion it is a *basic* lava; the typical acid lava being *trachyte*, the typical basic lava *basalt*. Fresh acid lavas are whitish, but basic lavas are usually nearly black in colour, all lavas when weathered taking reddish-brown tints. Under the microscope thin slices of lava reveal great differences. First, we have volcanic glass or *obsidian*, a lava which has rapidly cooled from a condition of complete fluidity, and which shows nebulous patches scattered through a glassy base. A very high power reveals that these patches are composed of minute crystals, called *microliths* or *crystallites*; and we are forcibly reminded of the resolution of the Milky Way into thickly-clustered stars by the telescope. Crystals are made up of microliths grouped about certain axes, and a completely amorphous glassy lava may be converted into a highly-crystalline mass by slowly cooling, thus giving the molecular forces time to act in the grouping of the microliths. Most lavas, when viewed under the microscope, exhibit a glassy paste or ground-mass containing micro-

liths, among which distinct crystals are distributed. Or again, when lavas consolidate at a great depth beneath the surface, the ground-mass is made up of small crystals, through which larger crystals are distributed. And finally, we arrive at the granitic structure, in which the rock is completely made up of large crystals without any ground-mass. One and the same rock may exist in each of these forms, according as it has been cooled slowly or rapidly, at a great depth beneath the surface or near to it. Thus, while *basalt* represents the lava form of one variety of volcanic rock, *gabbro* is the corresponding granitic or crystallized form, and *tachylyte* its glassy or obsidian form. They all have the same ultimate chemical composition.

The larger crystals probably separated from the amorphous masses beneath the volcano, and were carried up to the surface by the fluid material forming the ground-mass of the lava. Crystals frequently furnish abundant evidence of having been formed under enormous pressure. When examined by high powers of a microscope the crystals of granitic rocks are sometimes seen to contain cavities filled with liquid or gas, or with two liquids and a gas. Sometimes the liquid is water, sometimes a hydrocarbon like the mineral oils which are found in abundance in deep-seated rocks in various parts of the world. Not unfrequently the inclosed substance is liquefied carbonic acid, a gas which requires a pressure of nearly 600 lbs. on the square inch to liquefy it at the freezing point of water, and a much higher pressure at the temperature which exists a short distance beneath the surface of the earth. We have thus every reason for believing that the crystals of a rock have been formed in deep recesses in the earth, while the ground-mass has solidified at the surface. All lavas alike, when artificially fused, make glass.

But by far more abundant than the lava is the steam which issues from a volcano during eruption, and the rain and mud are more formidable enemies than the lava to the population near a volcano. It was mud and dry ashes, but particularly the former, which buried Pompeii and Herculaneum, not lava. With the steam a large amount of gases also escape, the chief being hydrochloric acid, sulphurous acid, boracic acid, carbonic acid, and sulphuretted hydrogen, as well as free hydrogen and nitrogen, ammonia, and some of the volatile metals, as arsenic, antimony, mercury, &c. The yellow coating round a volcanic crater is far more often ferric chloride, formed by the union of the iron of the rocks with the hydrochloric acid emitted from the crater, than sulphur which it resembles, and for which it is so commonly taken. The materials ejected from volcanoes during an eruption are not, as many may think, a wholly useless collection of debris. On the other hand, much of what is thus thrown out is of considerable commercial value. The volatile substances issuing from volcanic vents are at once deposited when they come into contact with the cool atmosphere; others form new compounds with one another and the constituents of the atmosphere; while others, again, combine with the materials of the surrounding rocks and form fresh chemical compounds with some of their ingredients. The deposits which are thus continually accumulating on the sides and lips of volcanic fissures consist of sulphates, chlorides, sal-ammoniac, sulphur, &c. At Vulcano regular chemical works have been established by a Scotch firm in the crater of the volcano, a great number of workmen being engaged in collecting the materials which are deposited around the fissures, and which are renewed by the volcanic action almost as soon as they are removed. This work, as one may readily suppose, is not at all times carried on with safety, for in 1873 a sudden outburst of activity within the crater took place before the workmen could escape, and several of them were severely burned by the explosions.

Besides the lava, solid substances are thrown up. These may be fragments of the sides of the volcanic fissure, as

for instance at Vesuvius, which is strewn with bits of limestone, even containing fossils. The "lava ornaments" so frequently purchased at Naples are made, not from lava, but from these bits of limestone altered somewhat by the heat and compressed steam. The escape of the compressed steam and gases from the boiling lava carries up the clinkery froth which perpetually forms on its surface, and which, when not burst into the tiny fragments called volcanic ash, is known to us as *pumice* (Lat. *spuma*, foam), and is in fact a sponge of glass, a mass of tiny glass bubbles. It is this ash or dust which is so dangerous a product, for it rises sometimes miles above the mountain, and the air carries it enormous distances, hundreds and even thousands of miles, or it falls mixed with the condensing steam, which forms a pine tree shape above the volcano, and buries whole villages in mud. In 1822, during the eruption, one could hardly breathe at Naples, so thick was the air with ash; and it penetrated everything, even into closed drawers and boxes, though Vesuvius is some miles away. In a slight outburst of Cotopaxi a competent observer was covered with dust 50 miles off, and careful measurements showed that some 2,000,000 tons must have been emitted. Yet this ash is so fine that 15,000 particles on the average make up a single grain in weight. In 1875 Norway was strewn with volcanic dust from Iceland, and the ashes from Vesuvius and Etna have often reached Constantinople.

When masses of half-fluid lava are flung into the air, as in eruptions witnessed by the present writer, they assume roughly spherical forms, and the superheated water which they (like all lava) contain in large quantities attempts to free itself as steam, distending them with bubbles. Such masses are called *bombs*. Often they burst, and the rough cindery fragments are called *scoria* or if small *lapilli*.

One product of a volcano would certainly be the last thing imaginable—this is *ice*. Yet it is readily to be found, and it owes its origin to the peculiarly deficient power of lava for the conduction of heat. The present writer has walked on a flowing lava stream with no other inconvenience than very warm boot-soles, yet a walking-stick caught fire if put down a crack. The snows on Etna are yearly covered by scoria and ashes, and serve the city of Catania with fuel, which is formed out of these snows by pressure. In 1875 masses of ice were discovered beneath the lava which had flowed from Vesuvius in the great eruption of 1872 over the snow which then lay thick upon the mountain.

Volcanic mud, when pressed and formed geologically into a rock, makes the building-stone called tufa, so much used in Naples and in ancient Rome, both great volcanic districts. Such rocks of tufa or of stratified scoria are generally penetrated by hard "dykes" of solid lava, evidently thrust through the mass in a molten condition while it was soft. Weathered cliffs of stratified volcanic rock show these dykes standing out like buttresses. See Plate I.

The distribution of volcanoes is very remarkable and suggestive. Counting only those of considerable size we may take the number of active volcanoes as from 300 to 350, but if we add the extinct volcanoes, still neglecting all the smaller specimens, the number is certainly not less than 1000. If we were to include all volcanic vents we should have to count by tens of thousands. This great subterranean volcanic force, the mighty antagonist of the ever-degrading subaerial agents—the first thrusting up the earth's crust as fast as the latter wear it down—a world-long battle between Zeus and Pluto—though widespread, is not evenly spread by any means. Thus, in the present day, whatever it was in past geologic epochs, Vesuvius is the only European volcano; but it has six neighbours in the islands of the Mediterranean—Stromboli and Vulcano in the Lipari group, Etna in Sicily, Graham Isle, a submarine volcano which sprang up in mid-ocean off the coast of

Sicily in 1831, and has since been worn away to a shoal, and Santorin and Nisuros in the Ægean sea.

The African Continent contains, at least, ten active volcanos known to us—four on the west coast, and six on the east coast; Asia has twenty-four, half of which are in Kamtchatka; America has eighty-two, of which twenty are in North America, twenty-five in Central America, and thirty-seven in South America; Australia has none.

We may reckon altogether 117 volcanos on continents and twice as many on islands. Those on continents are all upon or near the coast-line, the apparent exception of the Thian Shan group, in Central Asia, being readily explained by the former existence of a great Asiatic Mediterranean, of which the Caspian, Sea of Aral, &c., are the remnants. All oceanic islands which are not coral reefs are volcanos.

There are three great bands of volcanos and one smaller band, all of them showing a longitudinal, rather than a latitudinal direction: marking, no doubt, lines of weakness along the earth's crust where the subterranean fires have had power to burst it, marking also, as Darwin showed, areas of elevation in those slow fluctuations of the earth's surface which raise or depress the outline of our globe. The greatest of these bands stretches from Behring Straits to the Antarctic Circle, 10,000 miles, with several subsidiary branches, and contains over 150 active volcanos of large size—about half the total number. The second is not so continuous. It is united with the first by the chain of the Aleutian and Alaskan volcanos. This second band runs from British Columbia for 8000 miles along the western side of both Americas, with branches to the West Indies, &c., and contains eighty great volcanos. The third band, about 1000 miles long, traverses the Atlantic Ocean from north to south, starting from Greenland by way of Iceland, the Hebrides, the West of Scotland (where Skye, Mull, &c., are entirely made of the stupids, so to speak, of long-extinct volcanos), to the Azores, Canaries, Cape Verde Islands, Ascension, St. Helena, and Tristan d'Acunha, with three branches, one along the line of the Alps (all now extinct), another along the Mediterranean, and a third along the west coast of Africa, with about fifty large active volcanos in all. The fourth band is that of the east coast of Africa, with Mauritius, Bourbon, Rodriguez, and the extinct vents along the Red Sea.

The Sandwich Islands and the volcanos of the Thian Shan form two isolated groups. The island of Hawaii is very remarkable.

This island forms an irregular triangle, its sides measuring respectively 100 miles, 88 miles, and 76 miles. Its entire area (upwards of 4000 square miles) is composed of lava. It contains three lofty volcanic summits, Mauna Loa (13,700 feet) being the principal, and the others being about 11,000 feet and 10,000 feet above the sea level. On the flanks of Mauna Loa is the grand crater of Kilauea (1099 feet), remarkable as the largest on the globe, and as not surrounded by a cone of erupted matter. Within a deep sunken pit, 8 miles in circuit, covered with masses of solidified lava, and black and gloomy as the realms of Erebus, lies the crater itself, measuring 16,000 feet in length and 7500 feet in breadth. In one part a gully or ravine seethes with boiling lava, of remarkable fluidity, which sometimes swells like boiling water to a great height, and fills the whole area of the crater to the height of many hundred feet with a black, bubbling, hissing, and noisome mass. It rolls on rises, however, to the edges of the crater, but falls a vent in the mountain side. Small particles of the glassy, very fluid lava of Kilauea are shot into the air, and leave behind them glassy filaments like a tail. This is the so-called *Pele's hair*, Pele being the goddess of the mountain. Birds build their nests of it. The substance has been artificially produced by passing jets of steam through molten slag in iron furnaces, and a sort of

glass "cotton-wool" is produced, very useful for packing boilers, &c. Many formidable eruptions have taken place from this volcano within the present century—those of 1823, 1832, 1840, and 1855 being the chief.

A remarkable volcanic district in Mexico, after remaining undisturbed for 250 years, broke out into activity in 1759. A kind of fissure, or crevice, stretches from the Gulf of Mexico to the Pacific, in a line about 16 miles north of the city of Mexico. Along this parallel occurs a singular series of active volcanos; Tuxtla, the most eastern, is in 95° W. lon.; more to the west rises the snow-shrouded cone of Orizaba, with its ever-fiery crater, seen like a star in the depth of the night, which has obtained the name of Citlaltepētl, or the "Mountain of the Star." Popocatepetl, the loftiest mountain in Mexico, 17,881 feet above the sea, lies still further west, and is in a state of constant eruption, which, with the peaks of Iztaciluatl and Toluca, form a species of volcanic amphitheatre in whose bosom lie the city and lake of Mexico. These three great cones are united by a chain of smaller volcanos. On a plain to the south-west, about 70 miles in a straight line from the Pacific, occurs the volcano of Jorullo. It appeared suddenly, and rose 1683 feet above the plain on the night of the 29th of September, 1759, and is the highest of six volcanic cones which have been thrown up since the middle of last century. The eruption, which had been preceded by alarming noises and earthquakes, did not cease till 1760. Another eruption took place in 1819, when ashes fell in Guanajuato, at a distance of 140 miles, in such quantity as to lie 6 inches deep in the streets.

Several volcanos eject only streams of boiling water, as Volcano del Agua, in Guatemala; others, boiling mud, as in the islands of Trinidad and Java, and Cheduba in the Bay of Bengal. Solfataras, or vents in the ground which emit sulphur and sulphurous and other acid vapours and gases, are also manifestations of the hidden igneous agency which in the bosom of the earth seems in an incessant condition of unrest. Geysers are another variety of volcanic energy. Yet another is the curious *maud-volcanos*, seen in their most complete form in the Caucasus, where hills some hundred feet high and several miles long are formed by them.

Instances of submarine eruptions are by no means uncommon. It is recorded that in 1811 a volcano rose from beneath the sea off St. Michael, one of the Azores, forming a crater above the water a mile in circumference and about 300 feet in height. In July, 1831, a volcano (Graham Isle) rose in the sea between the island of Pantellaria and the coast of Sicily, forming a crater 210 feet in diameter and 20 feet above the surface of the ocean. In 1866 a small group of islands sprang out of deep water in the Bay of Santorin during a formidable eruption of lava.

Reference must be made to the volcanic phenomena of frost-bound Iceland. "God made the rest of the world, the devil made Iceland," is a Norse saying. Here a region of trachyte seems superimposed on an ocean of rolling fire. It consists of two vast parallel table-lands covered with snow-shrouded mountains or jokuls, stretching from north-east to south-west through the very centre of the island, separated by a longitudinal valley nearly 100 miles wide, which reaches from sea to sea. At the southern end of the valley, which opens on the sea in a broad plain, many volcanos are situated. Of these, Hekla is the best known, from its insulated position, neighbourhood to the coast, and its tremendous explosions. Twenty-three occurred between 1001 and 1766, one of which continued six years, spreading desolation over a country once the abode of a thriving colony, but now covered with scorias, ashes, and lava. But a still more formidable volcano is that of the Skaptar-Jökul, which broke out on the 8th of May, 1783, and did not terminate its destructive action till August.

The sun was hid many months by dense clouds of vapour, which extended to England and Holland, and clouds of ashes were carried many hundreds of miles to sea. The quantity of matter thrown out in this eruption was computed at 50,000,000,000 or 60,000,000,000 cubic yards. The lava flowed in a stream, in some places from 20 to 30 miles broad, and of enormous thickness, which filled the beds of rivers, poured into the sea nearly 50 miles from the places of its eruption, and destroyed the fishing on the coast. Some rivers were heated to ebullition, others dried up; the condensed vapour fell in snow and torrents of rain; the country was laid waste; famine and disease ensued; hundreds of people and thousands of cattle perished.

Of recent volcanic outbursts, there can be no doubt that before the famous eruption of Krakatao the eruption of Etna in May, 1879, was the most considerable. It was studied very fully by Professor Silvestri, who considers that it was the fulfilment of the abortive attempt made by the volcano in 1871. On the 29th of August of that year a rift opened on the north-east side of the mountain between the crater and Mojo, and thirty-five monticules were thrown up along its course, with one large crateriform mound from which lava was discharged. After seven hours of activity the dynamic forces suddenly decreased, and in two days all the effects ceased, but the rift remained open, and earthquakes were common in the vicinity. Silvestri then predicted that when the next eruption occurred the rift would prove the line of least resistance, and that lava would flow from it, and craters be opened along its course, and this prediction was completely verified in the eruption of 1879. The fissure then extended itself to a length of 6 miles, passing through the great crater. Eight eruptive mouths opened on the south side of the mountain, and discharged a small amount of lava; but the lava presently found an exit at a lower level on the north side, and on 28th May three new craters opened near Monte Nero, from which issued dense clouds of steam. From one of them lava flowed which formed a considerable stream, reaching to a distance of  $6\frac{1}{2}$  miles by the evening of the 29th. It stopped about half a mile from the village of Mojo, and then had a breadth of 23 feet and a height of 32 feet.

Since 1872 Vesuvius has been only active at intervals. Palmieri has published a full account of the 1872 eruption, and in annual reports has given the history of the mountain since that date. The eruption of Santorin, which began in January, 1866, and lasted till October, 1870, has furnished results of great interest to vulcanologists, and has led to the publication of M. Fouqué's magnificent "*Santorin et ses Eruptions*," in which the whole history of volcanic phenomena and the products is given.

All recorded volcanic outbursts are, however, thrown into the shade by that fearful occurrence which altered the geography of the Straits of Sunda in 1883. On the 20th of May a volcano burst out on the island of Krakatao in the straits, where there was an extinct volcano. The eruption rose to its height on 26th August of the same year, and with a terrific explosion, the noise of which was heard in Ceylon, 2000 miles away, while the tidal wave first stranded the French men-of-war off Tanatave, and then returning almost carried them ashore, did much mischief in Mauritius, and was felt on the coast of Africa. Krakatao was blown into fragments, other islands appeared and disappeared, and the whole configuration of the straits was altered. All over Asia, here in England, and even at Trinidad curious aspects of the sun at rising and setting were seen during several weeks, the sun frequently appearing blue or green, and the sunrise and sunset being phenomenally brilliant; and many observers set these phenomena to the dust or other emanations from the great earthquake. It

is said that over 35,000 persons lost their lives through this eruption.

We must account for volcanic action either by chemical or geological causes. Dr. Daubeny, following Sir Humphry Davy, is of opinion that vast quantities of the metallic bases of the earths and alkalis being stored in our globe's interior, their oxidation, from contact with air or water, causes the appalling phenomena of eruption. Bischof, regarding the interior as a fused and incandescent mass, suggests that the mechanical action of water, trickling through fissures in the earth's crust, and transformed into steam by the interior heat, will more readily account for them.

In a paper on "Volcanic Energy" read before the British Association in 1873, Mr. R. Mallet, C.E., F.R.S., maintained first his since famous theory, that it has its origin primarily in the contraction of the earth's crust, due to secular cooling and the tendency of the interior matter to shrink inwards, and thus leave the exterior solid shell unsupported. The lateral pressure arising from the crumpling force thus produced (which is vastly greater than the vertical weight of the crust), is expended in crushing portions of the solid crust together, along lines of fracture which are supposed to correspond to those of the volcanic cones which are distributed over the earth's surface. Each successive crush produces an earthquake shock, and is converted into heat sufficient to melt the rocks which line the walls of the fissure or lie beneath at high temperatures, and which in presence of elastic steam and gases are erupted at intervals both of time and space.

It cannot be denied that Mr. Mallet's theory, though attacked with many weighty objections, seems consistent with many observed facts connected with volcanic action. It has for its foundation an incontrovertible physical hypothesis—the secular cooling of the earth—and it seems to throw considerable light upon several observed phenomena of volcanic action; such as the distribution of cones and craters along great lines, the intermittent character of eruptions, and the connection of earthquake shocks with volcanic outbursts. If the annual contraction of the globe be assumed to have been constant for the last 5000 years, it would amount to little more than a reduction of  $3\frac{1}{2}$  inches on the earth's mean radius. This quantity, mighty as are the effects it produces as the efficient cause of volcanic action, is thus so small as to elude all direct astronomical observation.

The Plates accompanying this article explain themselves. Plate I. shows the formation of "dykes" of lava amidst masses of eruptive matter. Plate II. illustrates Jerulio, and also the general form of craters and cones. Plate III. gives the grand French group of extinct volcanoes, specimens of the fine conical shape, the almost flat shape, and the bulbous shape of cone produced by scoria, by fluid, and viscid lava respectively, and also shows the rapid changes in the form of a volcano (Vesuvius). Plate IV. gives illustrative maps of some of the regions spoken of, showing the lines of volcanic fissure. Plate V. shows the shape and relative heights of a considerable number of the most famous volcanoes.

Works of reference on the subject are—Dr. Daubeny, "*On Volcanos*" (1818); G. Ponlett Scrope, "*Volcanos*," and "*Volcanic Region of Central France*" (1825); Professor Geikie's "*Geology*" (1882); Fouqué's "*Santorin*" (1880); and above all Judd's "*Volcanos*" (1881). Mallet's paper in the *Philosophical Transactions* for 1873 should also be read.

**VOLE** (*Arvicoline*) is a group of rodent mammals, forming a subfamily of the *MURINE*. The body is thicker and more stoutly built than in the true rats and mice (*Murine*); the limbs are short or moderate; the tail is rather short, round, and hairy; the ears are short, often nearly concealed beneath the fur; the muzzle is blunt; the

molar teeth have flat crowns, presenting enamelled folds, in the form of alternating triangular prisms. The species are numerous and widely distributed.

The true Voles (*Arvicola*) number about fifty species, of which three are British. The Water Vole or Water Rat (*Arvicola amphibius*) is widely diffused throughout Europe, extending across northern and temperate Asia to China. It is common in England and Scotland, but is not found in Ireland. It is a little smaller than the common rat, being 12 inches in length, of which the tail measures nearly 5 inches. It is covered with a thick, shining fur, of a rich reddish-brown mixed with gray on the upper surface, and yellowish-gray beneath. The head is short, with a very blunt muzzle, small eyes, and ears nearly concealed in the fur; the incisor teeth are large and strong, coloured deep yellow in front. The feet are not webbed, and have five toes, the thumb on the fore-feet being very short. The water vole frequents the banks of rivers, streams, and ditches, in which it forms extensive burrows. It swims and dives with great facility. It feeds exclusively on vegetable substances, chiefly on aquatic plants, but in the winter it eats turnips and other roots, and the bark of osiers and willows; sometimes it does considerable damage in gardens. The female brings forth young several times in the course of the year, from two to six being produced at a litter. The Short-tailed Field-mouse or Meadow



Water Vole (*Arvicola amphibius*).

Mouse (*Arvicola agrestis*) is about 4 inches in length, exclusive of the tail, which measures rather more than an inch. The upper surface is grayish-brown, tinged with reddish or yellowish on the sides; the lower surface is ash-coloured, and the feet and tail are dusky. The field-vole is abundant in Britain, Northern and Central Europe, extending into Asia, but is not found south of the Alps or Pyrenees, nor in Ireland. It chiefly frequents low and damp meadows, especially in the neighbourhood of woods and copses, where it burrows extensively. It feeds chiefly on roots and herbage, sometimes attacking the bark of trees, and often does great damage in plantations. It feeds sometimes on insects, and will even devour its own species. The young, four to six at a litter, are produced in a nest made of moss and leaves placed among the herbage in a hollow of the ground. It breeds three or four times in the year. Great numbers are destroyed by owls and weasels. They are often trapped in pits excavated in the ground, and made water below than above. The Bank Vole (*Arvicola glareolus*) is another European species, less abundant in Britain. The fur is bright chestnut-red above and gray beneath, and the feet are white. It feeds on fruits and roots, and also on insects, worms and snails, and even young birds and eunions. The body is about 3½ inches in length, and the tail is about half as long as the

body. Several other species are found in Europe, one of which, the Snow Mouse (*Arvicola nivalis*), is found in the Alps and Pyrenees at elevations of 4000 feet or more. About a dozen species are found in North America, the most common being the Meadow Mouse (*Arvicola riparius*), resembling the field-vole in its habits. The MUSK-RAT or Musquash (*Fiber zibethicus*) and LEMMING (*Myodes*) also belong to this subfamily.

**VOLGA, THE,** is the longest, and, with the exception of the Danube, has the largest volume of water of any river in Europe; its entire course, which, in consequence of its various windings, exceeds 2200 miles in length, lies within the Russian Empire. The direct distance from its source to its mouth is less than 1000 miles. The area of its basin has been estimated at 600,000 square miles, or more than twice that of the Danube, and eight times as much as that of the Rhine. It rises in the Valdai Hills, 550 feet above the sea, near 57° N. lat., 33° E. lon., on the frontier of the governments of Tver and Novgorod, in a small lake formed by several springs, and it flows through the lakes of Oselok, Plara, and Volga, which it quits about 90 miles above Tver. Near Ostaschikov it receives the Selieharovka, issuing from Lake Seeliger, and attains the breadth of 150 feet; at Rshay-Vladimirov it becomes navigable for small boats, and at Tver, where it is 700 feet broad, for large barges. Having traversed the government of Tver in an easterly direction, it turns north-east to Yaroslav, then south-east to Kostroma and Nijni-Novgorod, where it receives the Oka; thence to Kazan, where, having been joined by the Kama, it becomes 1000 yards broad, turns nearly south, and having passed Samarsk, Saratov, and Astrakhan, divides into eight branches, which inclose seventy islands, and discharges itself by sixty-five mouths into the Caspian Sea, to which it is computed to bring 1,000,000,000 cubic feet of water in an hour. The rivers which join it, with the exception of the Oka, before it reaches Kazan, are of no great magnitude; but the Kama, which flows into it at that place after a course of 1000 miles, makes a vast accession to its waters. By a judicious system of canals, connecting the Duna with the Kama and the Volga, the Polar Sea communicates with the Caspian by a navigation of 4000 miles. The Volga is also connected by canals with the Black Sea, the Lake of Ladoga, the Neva, and the Baltic. Its banks are generally low, but extremely fertile; and there is no other part of Russia where so much oak timber grows as in the vicinity of this river. The navigation of the Volga is much obstructed, in the dry season of the year, by shallows and islands, and the volume of its waters is gradually but certainly diminishing; in May and June, however, the melting of the snow swells them, and often causes extensive inundations. At this season its depth is so increased that large ships descend it in safety from Tver to Astrakhan. Below the latter port the river is very shallow, in consequence of the number of mouths into which it divides itself before entering the Caspian Sea. In winter it is frozen to a great depth, the navigation being open only about 200 days in the year. The Volga abounds more in fish than perhaps any other river in the world, many thousands of small vessels being employed in catching them. Those taken in the largest quantities are sturgeon, carp, and pike of extraordinary size. Seals also come from the Caspian into the mouths of the Volga, where they are captured.

**VOLITORES** or **FISSIROSTRIS** is an order of birds, formerly classed with the *Passeres*. For some they form a group of a rather heterogeneous order, *Picariæ*, which also includes the *PICÆ* (Woodpeckers), *Psittaci* (Parrots), and *SCANNORUS* (Cuckoos, *Tonca*, &c.) The Volitores agree with these groups and differ from the *Passeres* in having a double, instead of a single, notch in the hinder margin of the sternum. The feet in the



Volitores are generally small, with but little grasping power; the toes are more or less connected together, and the sole of the foot is very flat. The bill is variously developed, but has a very wide gape. The legs are small and weak. The wings are strong, and the flight active and swift; the food consists chiefly of insects, and is taken on the wing. The following families are contained in this order:—Caprimulgidae (Goatsuckers, Plate I., fig. 1), Cypselidae (Swifts, fig. 3), Trochilidae (Humming-birds, figs. 4, 5), Meropidae (Bee-eaters, fig. 2), Trogonidae (Plate II., fig. 6), Momotidae (Motmots), Todidae (Todies), Upupidae (Hoopoes, fig. 7), Bucerotidae (Hornbills), Coraciidae (Rollers), Alcedinidae (Kingfishers), Galbulidae (Jacanars, fig. 8), and Capitonidae (Barbets).

**VOLKSLIED** (or *Folk-song*), the national ballad-music of Germany, which is very rich in such traditional compositions. Many of them are very beautiful and simple. The style is still a living one, and fine examples are from time to time added to the great repertoire. The last famous Volkslied written is the "Wacht am Rhein" (the Rhine Guard), which so stirred the army in 1870 as to become for the time the national anthem.

**VOLNEY, CONSTANTIN FRANÇOIS CHASSE-BŒUF, COMTE DE**, a French traveller, philosopher, and politician, was born 3rd February, 1757, at Craon in Angou, where his father was an advocate. He was educated at the colleges of Aunensis and Angers. In 1783 he set out for the East, and on his return to France in 1787 published, in two vols. 8vo, his "*Voyage en Syrie et en Egypte pendant les Années 1783, '84, et '85.*" He was elected deputy of the Tiers Etat in the National Assembly; he was also a member of the Constituent Assembly, and afterwards of the Convention, and up to 1793 he acted generally with the party of the Girondists. In September, 1791 he presented to the National Assembly his "*Ruines, on Méditations sur les Révolutions des Empires;*" formerly much read in England as "*Volney's Ruins of Empires.*" Sent to prison by Robespierre as a royalist, he remained in confinement for about ten months; he regained his liberty on the overthrow of the dictator, and soon afterwards he was appointed professor of history in the newly-established Ecole Normale, where for about a year he delighted crowded audiences by his lectures. In 1795 he drew up a very useful series of "*Questions de Statistique à l'Usage des Voyageurs,*" which were republished in 1813. In that year also he published a new method of studying Oriental tongues.

The Ecole Normale was suppressed in 1795, upon which Volney proceeded to the United States of America, but returned to France in the spring of 1798. In 1803 he published, in two vols. 8vo, his "*Tableau du Climat et du Sol des Etats-Unis d'Amérique.*" Volney was one of the senators who voted for the deposition of Bonaparte; and he was consequently elevated to the peerage of Louis XVIII. See Bossange's "*Notice sur la Vie et les Ecrits de Volney*" (Paris, 1821), and Berger's "*Études sur Volney*" (Paris, 1822).

**VOLOGDA**, a town of Russia, the capital of the government of the same name, and the residence of an archbishop, is situated on the river Vologda, 167 miles E.S.E. of St. Petersburg. It is in a beautiful district extensively occupied with gardens, and consists chiefly of old wooden houses. The public edifices are—two cathedrals, numerous other churches, a gymnasium, and many buildings and magazines belonging to the crown. The inhabitants, who number 12,000, manufacture woollens, linen, silks, leather, sealing-wax, soap, potash, cordage, ropes, bells, spirits, white lead, colours, vitriol, and have very extensive tanneries and candle manufactories; they likewise make very superior articles in gold, silver, enamel, and lacquered ware. The merchants trade with St. Petersburg and Archangel, to which they send hemp, tallow, Russia leather, linen, candles, linseed, bristles, salted and

frozen fish, &c. This commerce is greatly facilitated by the river Dwina, which connects the city with the White Sea. In the sixteenth century there was considerable English trade here.

**VOLSCI**, a nation of Latium, though probably not Latin by race, who were among the early competitors with Rome for the mastery of Latium, and were not subdued till 383 B.C.

They would be probably forgotten, except by the antiquary, if it were not for the brilliant legends preserved by Plutarch, enhanced for English readers by the wondrous glamour which Shakespeare threw over every tale he told, and which narrate how the noble and haughty Coriolanus, driven from Rome, humbled his native city at the head of these Volseians, and would, indeed, have utterly destroyed it had it not been for the prayers of his wife and of his mother. On returning to Antium he was murdered by the disappointed foes at Rome.

**VOLSUNG SAGA, THE**, is but the Norse version of those ancient legends of which the NIMBLEGRASS-LIED is the Teutonic expression. The love-scenes of Sigurd and Brynhild stand alone for beauty and power among ancient epics. The Volsung Saga has been most successfully translated by E. Magnusson and William Morris (London, 1870).

**VOLT**, the practical electrical or electro-magnetic unit of electro-motive force (*i.e.* difference of potential), so named in honour of the great VOLTA. A volt is 100,000,000 absolute units of E.M.F., an absolute unit being a little less than the E.M.F. of one Daniell's cell.

**VOLTA**, an important river of the Guinea coast, West Africa, forming the eastern limit of the Ashantee country, and of the British colony of the Gold Coast. It was first ascended for about 60 miles in the early part of this century by Starkeburg; 80 miles of it were explored in H.M.S. *Bloodhound* in 1861; and in 1872 M. Bonnat led an expedition up it for 200 miles. The rapid of Labelle, in lat. 7° 30' N., is the most formidable obstruction to the passage of the river in this long distance. During the rains (September and October) the river rises 50 feet. Several important commercial towns lie on its banks.

**VOLTA, ALESSANDRO**, was born in 1745, of a noble family, at Como, and educated in that city. In 1774 he was appointed professor of natural philosophy in the University of Pavia, and while he held that chair he made the discoveries which have immortalized his name. In 1777 he visited Switzerland, and in subsequent years most of the countries of Europe. In 1804 he was allowed to resign his professorship; and, giving up his studies, he spent the rest of his life at his native town, where he was seized with a fever which, after an illness of only two days, terminated fatally 5th March, 1826.

In 1775, while pursuing some experiments on the non-conducting property of wood when impregnated with oil, he was led to the construction of his "electrophorus," an instrument which beautifully illustrates some of the laws of electricity; and during these investigations he was further led to the invention of his electrical condenser. In 1777 he invented the elegant apparatus which is called the hydrogen lamp. About the same time he discovered a process for determining the proportions between the two gases, oxygen and nitrogen, which constitute atmospheric air; and he also invented the instrument which has been called the electrical pistol.

But his name is chiefly distinguished by his development of electricity in metallic bodies. Galvani observed in 1789 electrical action in the nerves of animals, but Volta was the first to show that the principle of excitation existed in the metals, and not in the nerves of the animal. He wrote two papers, in which he communicated his views and experiments to our Royal Society in 1792, for which he received the Copley gold medal. Further experiments culminated in the invention of what is designated a Vol-

**TAIC BATTERY**—an apparatus which has since, under its various modifications, produced such important results. By the faculty of skillfully combining experiments, and a profound sagacity in perceiving the consequences which might be deduced from them, Volta was enabled to make many important discoveries; but it is remarkable that he often held unfounded opinions upon the causes of the phenomena, and he does not appear to have pursued any of his researches so far as to arrive at mathematical precision in his deductions.

A collection of his works, dedicated to Ferdinand III., grand-duke of Tuscany, was published in 1816 at Florence, under the title, "Collezione delle Opere," &c.

**VOLTAIC ELECTRICITY.** The three chief ways of producing what is variously termed voltaic, current, and dynamical electricity, are by chemical, thermal, and dynamical means. Full accounts of these methods will be found under **BATTERY**, **THERMO-ELECTRICITY**, and below, under **Current Induction**. The present article will treat chiefly of potential, resistance, current, and how they are measured; secondary batteries; electro-magnetics and electro-dynamics; current induction; heat and work of the current; and electrical transmission of energy.

**Introductory.**—Sometime about the year 1786 Galvani, an Italian professor, while experimenting in his laboratory with some frogs' legs, observed that their muscles twitched convulsively whenever a frictional electrical machine was worked in the room. A short time afterwards, he noticed that some frogs' legs which had been hung upon *iron railings* by *copper wires*, relaxed in a similar manner every time the wind blew them against the railings. He concluded that the electrical force resided in the muscles and nerves of the frog. Another Italian professor named Volta, however, investigated the matter more thoroughly, and showed by means of a delicate condensing electro-scope—a combination of condenser and electro-scope [see article on **ELECTRICITY**],—that electricity could be produced by the *mere contact* of any two dissimilar metals, and that the frogs' legs merely served the purpose of an electro-scope or galvanoscope to render the presence of electricity visible. He discovered, by soldering together two bars of different metals, that according as one or other was in contact with his condensing electro-scope, this apparatus was charged positively or negatively. Accordingly he arranged the following *contact series*, in which any one on the list is considered *positive to*, or at a *higher electrical potential* than, any other following it, when contact is made between the two in air—zinc, lead, tin, iron, copper, silver, platinum, graphite or carbon. Volta's next discovery was that it was not necessary for the substances to be in actual contact, but that even better electrical results were obtained when they were placed

Fig. 1.

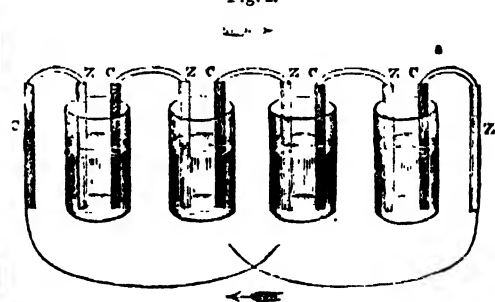


in a vessel, and contact was made by means of a liquid which touched them both, as is shown in fig. 1, where zinc and copper are taken, as being cheap, convenient, and efficient. The circuit is completed by means of a copper wire, which connects the copper and zinc plates outside the cell or vessel. That a *complete circuit is necessary to an electric current* is a fact which must never be lost sight of, whether the circuit be completed by a wire or partly by the contact, as is the case in telegraphy.

**Potential, Difference of Potential, and Electro-motive Force.**—The theory of electric potential is a very difficult one to grasp, but some idea of it is absolutely necessary to a proper understanding of the subject. *Potential* means the capacity of any agent to do work by virtue of its position. If we wind a weight of one pound through a height of one

foot, we have expended one foot-pound of work on it, and we have also given to it a potential to do one foot-pound of work. If we now let it fall under proper control, we can recover the work expended on the weight (less that absorbed by friction) in work done by the weight during its fall to its former level. If we wind up a clock weight of 20 lbs. through a height of 5 feet, we expend 100 foot-pounds of work, and during its fall through the 5 feet it gives back work in the form of keeping the clock going for eight days. One pound at the sea level (which is always taken as zero) possesses no potential energy; 2 feet up it possesses 2 foot-pounds, 3 feet up 3 foot-pounds, &c., and the weight possesses 2 or 3 foot-pounds of potential energy, not according to its *absolute* position, but according to its *relative* position, or on account of the difference of level between its fictitious and its natural positions of rest. This fact is well shown by the illustration of water at a higher than its natural level [see **ELECTRIC LIGHTING**], where the difference of level causes a pressure, or aqua-motive force (so to speak), and this force, when the tap is opened, causes a flow or current of water through the pipe. So in the case of the voltaic current, it is not so much absolute potential that we have to do with as the difference of potential between two dissimilar substances, which causes a difference of electrical level or pressure, and, when the circuit is completed, this electrical pressure produces an electric current. Just as water flows from a higher to a lower level, so electricity flows from a point of higher to one of lower potential. Referring to the contact series of substances given above, it will be seen that zinc is at a higher electrical potential than copper when the two are in contact in air; and this holds good generally about these two

Fig. 2.



metals—the one *from* which the current flows being marked positive (+), and that *to* which it flows negative (−). We shall not discuss in this article the question of whether there is a transference of + electricity in one direction, and at the same time of an equal quantity of − electricity in the opposite direction along the circuit, as that would not serve any good purpose. It is sufficient, in the meantime, to consider a current of electricity as a transference of electricity (whatever electricity may be) from a point of higher to one of lower potential, or from a point in a circuit marked +, to one marked −. If we have a zinc-copper cell of a given E.M.F. (electro-motive force), then we cannot increase that E.M.F., however much we may enlarge our plates, because the difference of potential depends solely on the nature of the substances, and not on their size. We may, however, have an increased E.M.F. by adding to the number of cells, and connecting them up, as shown in fig. 2, when the total E.M.F. is the sum of the E.M.F.'s of all the cells. This is called connecting up in series. Strictly speaking, electro-motive force is the total electrical pressure generated, and difference of potential is only that part of the E.M.F. employed in forcing the current through the outside or working circuit.

**Resistance.**—There is no pipe, however smooth, but impedes the flow of water to some extent by friction; and so there is no conductor but has, in a greater or less degree, the property of impeding the absolutely free flow of electricity along it. This property (which might be termed electrical friction) is known as *resistance*, and varies directly with length and temperature of a given conductor, and inversely with the weight or the area of cross section and purity. Different substances, too, have different resistances; and the resistance of a cubic centimetre of a substance, compared with that of the same size of pure copper, is known as its *specific resistance*. There are various ways of reducing the resistance of a cell. We may increase the size of the plates, and thus give the current a greater number of paths by which to pass from one to the other; or we may bring them closer together, and reduce the length of liquid which the current has to traverse, and as the liquid resistance in a cell is generally high, the nearer we bring our plates the better, taking care, of course, that they do not actually come into contact with one another.

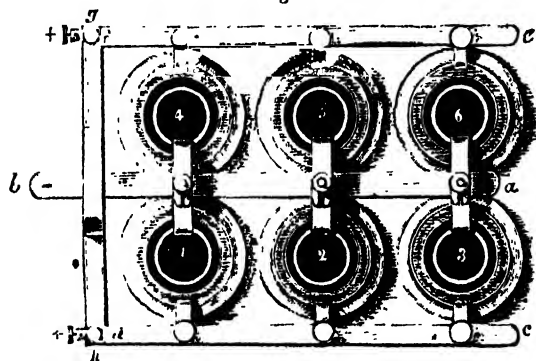
**Current.**—Just as we speak of a flow of water as being so many gallons per minute, so we describe the electric

the total  $R = \text{sum of all the resistances of the cells, or}$

$$C = \frac{E}{R} = \frac{6}{6} = 1.$$

**Production of the Current and Action in the Cell.**—For about forty years after Volta's discoveries the contact of dissimilar substances, either actually or through some conducting medium, was regarded as the seat of the electromotive force of the cell and the cause of the current. Since then, however, owing to the researches of Faraday and others who followed in his steps, a new school has sprung up, which advocates the chemical theory—*i.e.* that these phenomena are solely due to the chemical action which goes on in the cell. We shall not here discuss the merits or demerits of the two theories, nor shall we identify ourselves with one school or the other; but, steering a middle course, consider that both contact and chemical action play their part in giving us that which alone concerns us in the meantime—the electric current. Suppose we take a piece of clean copper and one of zinc, place them in a vessel containing a very weak solution of sulphuric acid ( $H_2SO_4$ ) and water, and join their outer ends by a wire, we shall have the very simplest form of a voltaic cell. The current is supposed to start at the zinc plate and to flow through the cell to the copper plate; for, as has been already stated, zinc (Zn) is electro-positive to copper (Cu); while outside the cell the current flows from Cu to Zn. But as it is only that part of the current which flows outside the cell which is of practical value to us, we call the copper  $+$  and the zinc  $-$ . The outer terminations of these plates are usually furnished with brass binding-screws, for handiness in attaching the wires of the outside circuit; and these binding-screws are known as *terminals* or *poles* of the battery. So in all the figures relating to voltaic electricity, the end marked  $+$  is supposed to be connected to the copper pole, and that marked  $-$  to the zinc pole of the battery. (Of course in some cells, such as Grove's or Bunsen's, instead of copper, read platinum or carbon, as the case may be.) The action in the cell is briefly as follows:—The sulphuric acid attacks the zinc, forming zinc sulphate and setting

Fig. 3.



current as so many *coulombs* per second [see ELECTRIC LIGHTING]. So that current strength means simply a rate of flow of electricity along a circuit. Now according to Ohm's Law [see ELECTRIC LIGHTING, to which the reader is also referred for an explanation of the practical units hereafter employed] the current carries directly as the *electro-motive force*, and *inversely as the resistance of a circuit*, or as it is commonly expressed,  $C (\text{amperes}) = \frac{E (\text{volts})}{R (\text{ohms})}$ . The current can be increased,

then, by increasing the E.M.F., or by reducing the  $R$  of a battery (assuming the outside resistance as constant or negligible), or by a combination of the two. This is effected by coupling up cells, as shown in fig. 3, where six cells are shown in plan, with all the coppers joined together by the outer bars,  $c d, c' d'$ , and the cross bar,  $g h$ , and the zincs similarly connected by the centre bar,  $a b$ . This is the same as having one large copper and one large zinc plate in one large cell, with the copper and the zinc plates six times the size of those of one cell. This arrangement is known as coupling up cells in parallel or for quantity.

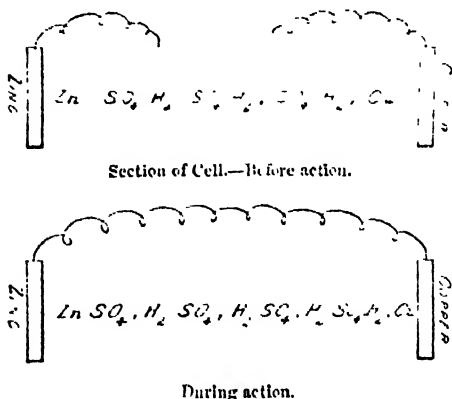
Referring to what has been said above on electro-motive force and resistance, we see that this will give us only the E.M.F. of one cell; but it will give us the resistance of only one-sixth of one cell. Hence the current will be

$$C = \frac{E}{R} = \frac{1}{\frac{1}{6}} = 6, \text{ or we shall have about six times}$$

the current strength that we should have if the cells were joined in series; for in series (see above) we should have the total E.M.F. = sum of all the electro-motive forces, and

free hydrogen, which travels with the current and appears at the copper plate in the form of gas bubbles. The action may be graphically shown thus,  $H_2SO_4$  and  $SO_4H_2$  being identical:—

Fig. 4.

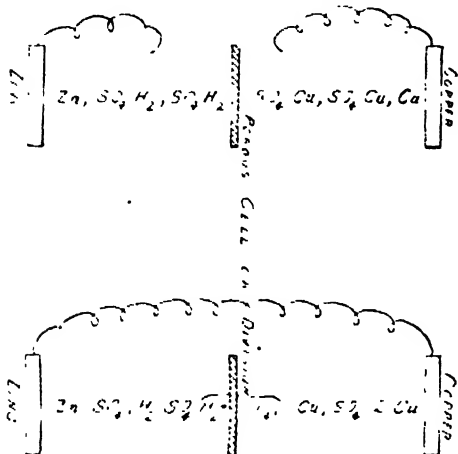


The free hydrogen does not combine with the copper, but clings to its surface, causing *polarization*. [See BATTERY and ELECTRO-CHEMISTRY.] In a two-fluid cell, which is designed to prevent polarization, the action is as represented in figure 5. Thus we have copper set free at the copper plate of the battery, which is deposited there-


upon, and interferes in no way with its free and continuous action. Of course, in other cells the details of the chemical reaction are slightly different, but the same principle—viz., that of absorbing the mischievous hydrogen—applies to all. Seeing that the zinc is eaten away during the

Fig. 5.

Section of Cell.—Before Action.



During Action.

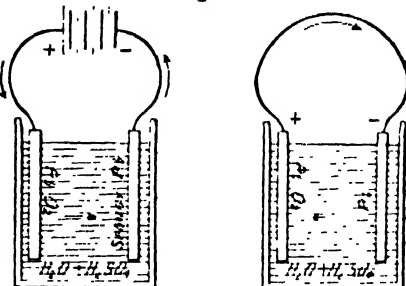
action in the cell, while the copper is either unaffected or increased in bulk, the former is usually made larger than the latter. Hence it is usual, to save time, to represent a battery of, say, five cells thus —  +.

For further information, see BATTERY.

*Secondary Batteries.*—The difference between the batteries we have hitherto been speaking of, and those we are now about to consider, is that while the former are ready to give a current the moment they are put together, the latter can give no result until after they have been prepared by the passage of a current from some other battery or from a dynamo. Hence the former are called *primary*, and the latter *secondary* batteries. If the reader refers to the article on BATTERY he will find that hydrogen has a powerful E.M.F. when separated from oxygen, owing to its chemical affinity for that gas. Any battery which takes advantage of this circumstance for the production of a current, may be called a *secondary battery*; for a current must first be passed through the cell to effect their separation. [See ELECTRO-CHEMISTRY.] Such were the cells of Gaultier, Ritter, and Grove. Platinum, however, which they used, was too expensive; and Planté, as well as all who have come after him, used lead, as being a good conductor, very porous, and cheap. The current is produced in *all* secondary cells by the same agency—viz. the electro-motive force of hydrogen in uniting with oxygen. Fig. 1, Plate I., shows such a cell of a modern form, made by the Electrical Power Storage Company of London. It consists of a glass vessel with two pieces of wood in the bottom, upon which rest thirty-one lead plates in diluted sulphuric acid, in the proportion of ten of water ( $H_2O$ ) to one of acid ( $H_2SO_4$ ). These plates are indented on both sides with pyramidal perforations opposite each other, so that the minimum part (red lead or  $Pb_2O_3$ ) with which each is coated may be "keyed" in, so to speak, and thus adhere. Eleven of these plates, the + plates, are attached at one side to a horizontal leaden bar, the end of which forms a terminal, while the remainder or — ones are attached to another similar bar at the other side, the plates being

kept from touching by small india-rubber studs introduced between them at intervals. During charging, the + plates form the anode, and the — plates are the kathode [see ELECTRO-CHEMISTRY]; while in discharging, the situation is reversed, as shown below (fig. 6), where two only of the plates are represented. As may be expected, then, while a current passes through the cell, the kathode is robbed of its oxygen, which appears at the anode, so that we soon have on the former spongy lead, affording a very large surface

Fig. 6.



of action, and on the latter we have now  $Pb_2O_3$  or simply  $PbO_2$ . The cell is now *polarized* or *charged*, and if we join its poles with each other the hydrogen (in the  $H_2O$  and  $H_2SO_4$ ) next the oxygen combines with it; more comes along to take its place; this in turn combines with more oxygen, and so on; while all the time oxygen is being set free at, and combines with, the Pb of the anode or lead plate. Thus the one set of plates is losing O while the other is gaining it; until, instead of having Pb and  $PbO_2$  on the two sets, we have on both  $PbO_2$ , and the action stops. In other words, the plates are no longer *dissimilar*, therefore there is no difference of potential, and no current.

Fig. 7.

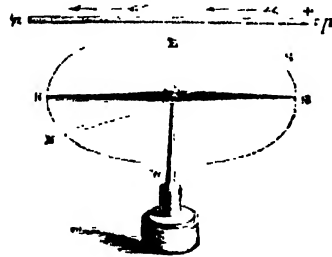
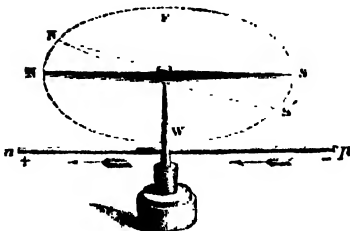


Fig. 8.

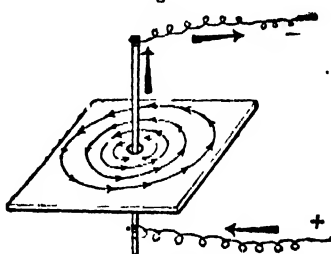


The cell is now discharged, and must be recharged before it can be used to give a current. For complete descriptions of the construction, action, and maintenance of secondary batteries, see Munro & Jamieson's "Pocket-book of Electrical Rules" (Chas. Griffin & Co., fifth edition), or Sir David Salomon's "Hand-book on the Management of Accumulators" (Whitaker & Co.)

*Relations between Currents and Magnets.*—In the year

1819 Ørsted, a Danish philosopher, made the important discovery that when a wire carrying an electric current is stretched above or below and parallel to a pivoted magnetic needle, as shown in figs. 7 and 8, the latter is deflected to one side or the other, according to the direction of the current. This discovery, as applied in the galvanometer (current measurer), has rendered the most exact tests and measurements in the science and practice of electricity possible. The direction in which either pole of a needle will be deflected (and by inversion the direction of the current when the deflection is noted) is given by the rule first laid down by Ampère:—*If a man imagines himself part of the circuit, so that the current flows from his feet to his head, and looks towards the needle, the north-pointing pole will turn towards his left hand.* Or, place the right hand with the palm on the wire (keeping the fingers pointing in the direction in which the current flows through the wire), then the extended thumb points in the direction in which the north-seeking pole of a compass needle will be deflected if placed under the wire. Subsequently it was discovered that when a wire carrying a current is dipped among iron filings, the filings will cling in thick masses to the wire, and will set themselves at right angles to it. These effects are due, not to any magnetism in the wire itself, but to the fact that it is surrounded, like a magnet, by a magnetic field which is undergoing a molecular stress in a certain definite direction while the current is flowing. That this is the case may be shown by the experiment, already described [see ELECTRIC LIGHTING], of passing a wire, in which a strong current flows, through a piece of cardboard, and sprinkling iron filings on the board. If, now, the card be tapped, the filings will arrange themselves in a series of concentric circles; and if there are any long pieces of iron among them these will set themselves tangentially to the circles. Fig. 9 shows by arrows the direction in which a free

Fig. 9.

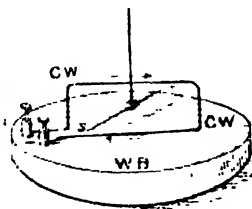


north-pointing pole would be urged round the wire. Seeing, however, it is impossible to get a magnet with only one pole, the corresponding free south pole would be urged in the contrary direction; and as these forces on the magnet are equal and opposite, the result is, as we have seen, that it places itself tangentially to the wire. By employing a test needle—a light delicate magnet suspended by a very fine cocoon silk fibre—this may be clearly shown; the reason being that every body susceptible to magnetic influence will place itself, if free to move, in such a position that the greatest number of lines of force pass through it from pole to pole.

**Galvanometers.**—The simplest form of galvanometer is shown in outline in fig. 10. It consists of a wooden board, w n, on which is mounted a coil of wire, c w (only one turn being shown for the sake of clearness), whose ends are firmly soldered to two brass screw terminals + and -. Within this coil a magnetic needle, n s, is suspended or pivoted, so as to be quite free to move easily and with little friction in a horizontal plane. In the sketch the current is shown by arrows to flow from left to right above, and from right to left below the needle,

which is shown with its north-pointing pole deflected away from the observer. A simple application of Ampère's rule will show that these two parallel portions of current, though opposite in direction, aid each other in forcing the needle out of the magnetic meridian. Such is substantially the construction of all galvanometers, the only difference being in details. In the actual instrument there are many turns of wire surrounding the needle, for the purpose of increasing or multiplying the effect of very feeble currents and rendering their presence easy of detection. Hence the common names given to these simple galvanometers of *multipplier* and *detector* (fig. 3, Plate I.)

Fig. 10.



The axis of the needle, too, is prolonged to the outside of the coil, and bears a long, light pointer of glass or aluminium, which, travelling over a graduated scale, indicates more clearly the direction and extent of the deflection than if we looked at the needle itself. The force with which the current in the coils of a galvanometer deflects the needle is proportional to the strength of the current, to the number of times it goes round the needle (number of coils of wire), and inversely to the radius of these coils (mean distance from the centre of the needle). This force is called a couple [see DYNAMICS], and is greatest when the needle is lying in the magnetic meridian and in the plane of the coils. But there is another couple acting simultaneously on the needle—viz. that due to the horizontal component of the earth's magnetism. We know that a pivoted needle at rest always lies in the plane of the magnetic meridian, and is held there by the directive action of the earth's magnetic poles. If we deflect it from that position the couple due to earth's magnetic field will tend to restore it to its former direction. This couple is greatest when the needle lies east and west, as may be seen by the greater back swing of the needle the more it is deflected from its north and south direction. When, then, a galvanometer needle is deflected it is acted on by the couple due to the current, which is decreasing in effect as the deflection becomes greater, and by the couple due to earth's magnetic force tending to bring it back, whose effect increases with the extent of the deflection. These two forces are opposite, and when the needle comes to rest we know that they must be equal or in equilibrium. Without going into any mathematical demonstration, let it suffice to say that if

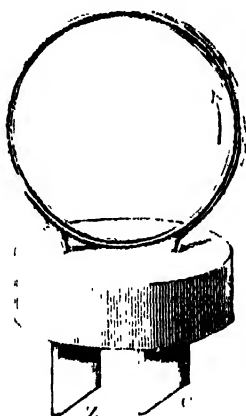
C	stands for current strength in C.G.S. units,
$\pi$	" ratio circumference of coils,
d	" diameter
n	" number of turns,
H	" horizontal component of earth's magnetism,
$\theta$	" angle of deflection from magnetic meridian,

then  $C = \frac{r}{2\pi n} \times H \times \tan \theta$ . This quantity,  $\times 10$ , gives strength of current in amperes, or in practical units of current. That is the principle of construction of the simplest and yet most reliable form of galvanometer—viz. the *tangent galvanometer*. This instrument (fig. 4, Plate I., of which a b, c d are the terminals) consists of a very stout wire (usually a single turn), bent into the form of a circle of about 25 centimetres (10 inches) radius, and resting on a wooden base provided with levelling screws and a spirit level. Pivoted to the base is a semicircle

of wood, which carries a circular box containing the card, usually graduated in tangents of angles; and in the centre a very short magnetic needle (not more than half an inch long), delicately pivoted by a jewelled centre on an iridium-tipped point. The object of having such a very large thick circle of wire in comparison with the size of the needle is to have at the centre, where the needle lies, as nearly as possible a uniform magnetic field; that is, a field like the earth's, where the lines of force are sensibly straight and parallel to each other. To note accurately the movements of such a very small needle, a light, stiff pointer of aluminium is generally fastened to it at right angles; but a better plan would be to fix on the end of the needle a light glass mirror, by means of which a beam of light from a lamp placed opposite can be thrown on to a scale. This is done in Sir William Thomson's mirror galvanometer [see TELEGRAPHY, Plate II.], so largely used in submarine telegraphy and in all delicate testing work. In this case, however, the needle (consisting of several very small pieces of magnetized watch-spring, with similar poles adjacent), is fastened to the back of a concave mirror smaller than a three-penny piece, which is suspended by means of an almost invisible cocoon silk fibre, inside a brass tube. Around this tube are wound the coils of wire, and the whole is inclosed by a cylindrical brass case. Opposite the galvanometer stands the lamp and scale with a lens for focussing the beam, so as to give a clear image or spot of light. Another very sensitive form of galvanometer is the *sine galvanometer* (fig. 5, Plate I.). In construction it differs essentially from the tangent galvanometer in only two points: the needle may be as large as we choose, and the frame of the coil must be pivoted so as to turn round a graduated circle placed below it. First, the instrument is set with needle and coils in the magnetic meridian. A current is now sent through the coils, which deflects the needle, and the movable coil is turned round in the same direction—forcing the needle still further from the magnetic meridian, until once again the coil and the needle lie in the same plane. The angle through which the coil has been turned is now read off the under scale; and the strength of the current is found by the above formula, substituting *the sine of this angle* for the tangent of the angle of the needle's deflection. Besides the method already indicated of increasing the number of turns of wire, we can multiply the effect of the current in a negative sense by making the earth's opposing couple as weak as we please, while maintaining the deflecting couple of the current unaltered. One method of doing so is by using a controlling magnet in the immediate vicinity of the needle, with poles opposing and neutralizing those of the earth's magnetic field. One of these magnets is shown on the figure of the Thomson mirror galvanometer already referred to. This magnet can be slid up or down the brass support and turned round to any angle with the magnetic meridian. Another method is that of using what is known as an *astatic pair of needles* (Lat. *astasia*, standing), which consists of two needles of very nearly equal strength, rigidly fixed together, one above the other, with poles reversed. On such a combination the earth's force has very little directive or restoring effect; in other words, it will stand still in any position we place it; and hence an exceedingly weak current will give a good deflection. An *astatic galvanometer* is represented in fig. 2, Plate I. Usually the coils only encircle one needle (preferably the lower), but sometimes both needles are surrounded by coils. In such sensitive galvanometers as the mirror, sine, and astatic, for the measurement of considerable currents, it is necessary to use a short or set of coils of low resistance, so that only a small known proportion of the current shall pass through the galvanometer. Otherwise, even if the instrument is not seriously injured, the deflection will be beyond the range of the scale. See *Electrical Measurements*.

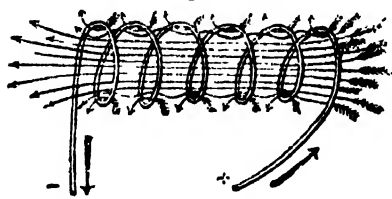
*Electro-magnetics*.—If we break a magnet in two pieces we shall have two magnets; into any number of pieces, we shall have as many magnets; if we cut it in thin slices, every slice will be a magnet; and in every case the poles will be similarly placed to those of the original magnet. One of those slices, having N. polarity all over one face and S. polarity all over the other, is known as a magnetic shell. It is made up, as it were, of a great number of little magnetic bricks, all built up end on, and with their similar poles adjacent to each other. Suppose now we take a single turn or circle of wire (similar to that of the tangent galvanometer) and pass a current round it, we have just such another magnetic shell, with one polarity all over one face, and the other polarity all over the other.

Fig. 11.



If we suspend vertically such a coil conveying a current by a fine thread, and bring up to its centre one pole of a bar magnet, we find that it is either attracted by, and threads itself on to the magnet, or it is repelled, forced round, and then is attracted, according as we present a like or an unlike pole. A better way of showing this would be to employ a floating battery, such as De la Rive's (represented in fig. 11). This consists of a very small coil of insulated copper wire, whose ends are soldered to small pieces of copper and zinc respectively, which pass through a cork or wooden float. The whole floats in a large beaker of acidulated water. Let us now coil our wire into a helix or solenoid (like that represented in fig. 12). Seeing that each circle is a magnetic shell while a current is flowing in it, and that these circles are lying close together with their dissimilar faces next each other, and consequently neutralizing each other, we should expect to find—what indeed we do find—that there is free polarity exhibited only at the ends. Such a coil exhibits all the properties of a magnet—pointing north and south if freely suspended, attracting and repelling the unlike or like pole of another solenoid or of a magnet, and above all conferring its magnetic properties on any magnetic body placed within the coils. If we try the magnetic strength of one of these solenoids by a test needle, the nearer we bring it to one end the greater is the attractive pull, while the further away the weaker the pull. By reference to fig. 12 the reason is obvious.

Fig. 12.



The lines of force are there seen to diverge as they issue from the open end of the coil, so that the further away we go the fewer lines of force we find passing through a given perpendicular space—or in other words, the magnetic field becomes weaker. Air possesses great magnetic resistance or small magnetic permeability (the one word is the converse of the other), and we find the whole space in and around, above and below the coil traversed by magnetic

**lines of force.** Steel possesses much greater permeability than air, that is, the lines of force find an easier passage through it from pole to pole; and if we insert a bar of this metal into our solenoid, we find comparatively few choosing the air passage, and a great number that through the steel. In other words, it concentrates the lines of force within itself, greatly enhances the magnetic effect, and itself becomes a magnet. By substituting a bar of very soft, well-annealed iron, we find, on account of its permeability being much greater than that of steel, the magnetic effect still further increased, and we have for the time being a far stronger magnet than the steel one. The soft iron, however, is only a magnet so long as the current flows, or a temporary magnet, while the magnetism of the steel bar is permanent. This is accounted for by the fact that the lower permeability of steel compared with soft iron, while it renders it less susceptible of magnetization, also makes it much more difficult to demagnetize. A steel magnet thus made will retain its power almost undiminished for a very long time; but the slightest jar or shake is sufficient to deprive the soft iron one of nearly all its induced magnetization. An arrangement such as we have described, of a soft iron core wrapped round with coils of well-insulated copper wire, is called an *electro-magnet*, and is eminently useful in very many ways. It is largely used in telegraphy, the working of railway and other signals, electric bells and alarms, electric regulators of clocks, dynamos, arc-lamps, &c., current and potential meters, and in the field magnets of dynamos and of electro-motors. To determine the polarity of an electro-magnet, having given the direction of winding and of the current, the following rule will be found useful:—Place the right hand on the coils, palm downwards and fingers pointing in the direction of the current; then, if the thumb be stretched out, it will indicate the north-pointing pole. If a certain polarity is desired, it is easy by following the above rule to determine what should be the direction of winding and of the current. A very common form of electro-magnet is shown at fig. 1, Plate II., where *E.M.* represents the electro-magnet coils, with cores of soft iron fashioned like a horse-shoe magnet. *w, w,* are the wires, the two inner ones being joined together so as to connect the two limbs of the magnet with one another, and the two outer ones being joined to the poles of the battery as indicated. *A*, is a soft iron armature across the poles of *E.M.*, supporting a scale pan, upon which weights may be placed to test the magnet's sustaining strength. The whole is supported on a stand furnished with three screw feet to keep it level.

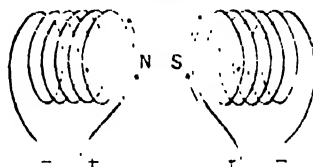
In the very useful form of laboratory magnet shown at fig. 2, Plate II., the coils are wound on wooden bobbins, and can be slipped on or off the iron cores at will. This plan is always adopted in constructing the electro-magnets of modern dynamos, because it offers great facilities for the examination of the coils separately, and for the correction of any fault which may be found. The form and shape of an electro-magnet is determined chiefly by the purpose it is intended to serve, because a form which would do very well for some purposes would be quite unsuited for others. If we wish to have an electro-magnet whose strength shall vary very much or very quickly, and which shall contain the least residual magnetism, we must make it in the form of a short thick bar, and of the best Swedish soft iron. The shorter a bar is, the greater will be the depolarizing influence of its poles on the mass of its interior; while if it be long and thin, with the poles far apart, the magnet, even if made of very soft iron, will retain a considerable amount of residual magnetism after the current has been cut off. For a similar reason a ring magnet with no free poles—such as are used in making transformers—will retain a very large quantity of residual magnetism. The attractive pull of an electro-magnet upon its keeper is much used in telegraphic instruments, electric bells,

mechanism for working railway signals, &c. The theory of this attraction is that if a piece of soft iron be placed in a magnetic field, it has a tendency to move from a weaker to a stronger part of the field, or to move in such a direction as to allow the greatest possible number of lines of force to pass through it. For example, suppose we hang a soft iron plug on one end of a common balance, immediately above the centre of a hollow coil or solenoid, through which a strong current is passing, as is represented in fig. 3, Plate II. The lines of force are seen springing from the upper end, *s, s*, of the solenoid and spreading out as they recede. The result is that the plug is pulled downwards and sucked into the coil. To counteract this, weights are placed in the scale pan of the balance, and the force of attraction is weighed against the force of gravity. Sir William Thomson in the construction of his gravity voltmeter, and Professors Ayrton and Perry in their latest forms of ammeter and voltmeter have adopted this plan, only the latter, instead of using a weight and arm, balance the attractive force by means of a spiral spring attached to a light pointer, which travels over a graduated scale and records the number of amperes or of volts which are used in causing the attraction.

**Electro-dynamics.**—We are now in a position to study the mechanical relations which subsist between conductors carrying currents, and if we do so in the light of what has been already said we shall find that these simply resolve themselves into the magnetic attractions and repulsions of the fields of force set up around the conductors by the currents. The science of electro-dynamics was founded by Ampère, and fig. 4, Plate II., represents an arrangement devised by him (called Ampère's stand) for rendering a conductor movable without interruption of its current. A wire is bent into a rectangular form, and its two ends—which terminate in fine points, one above the other, so that a vertical through the centre of gravity passes through them both—dip into two small metallic mercury cups, *x* and *y*, the weight being borne by the upper point only, which touches the bottom of its cup. These cups are attached to two horizontal metal arms or brackets, supported on metallic pillars, *A* and *B*, which can be connected, as shown, with the terminals of a battery. The wire thus forms part of the circuit, the current flowing down the side of the rectangle and up the other.

The laws of electro-dynamics are as follows:—1. *Successive portions of the same rectilinear current repel one another.* This law is not universally accepted, so we shall content ourselves with merely mentioning it. 2. *Parallel currents, if in the same direction, attract, and if in opposite directions, repel one another.* Let us suppose two solenoids carrying currents, freely suspended, and brought face to face, like those in the figure. According

Fig. 13.



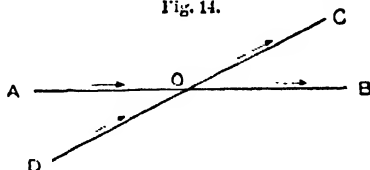
to the above law, these two faces should attract each other, because they carry parallel currents in the same direction. Applying the rule given in the last division (*Electro-magnetics*) for finding the polarity of a solenoid, we shall find that the face marked *N* will possess north-pointing and that marked *S* south-pointing magnetism; and we know [see article on MAGNETISM] that unlike poles attract each other. Hence the attraction. Referring now to Ampère's stand, the current goes up arm *A*, down left branch of suspended wire, up right branch, and down arm *B*. Ac-



Accordingly, as the upward current in A and the downward current in wire are the first to feel each other's effects, the quadrilateral is represented as being repelled. Siemens's electro dynamometer (electric-force measurer) is constructed on this principle. It consists of a coil of wire of many turns fixed firmly on a frame of wood. Outside of this coil, and with its plane at right angles to it, is a second movable coil, consisting of a single turn of stout wire, whose ends are made continuous with those of the other coil by dipping into the same mercury cups, an arrangement similar to that of Ampère's stand, which enables the same current to be sent through both coils simultaneously. There is thus a strong force of attraction and repulsion between the coils, tending to twist the movable one out of its position, and the moment of this force is proportional to the square of the strength of the current.

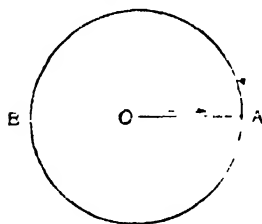
3. *Currents whose directions are inclined to each other at any angle attract each other if they both flow either to*

Fig. 14.



from the vertex of the angle, and repel each other if one flows towards and the other from the vertex. In fig. 14, then, we should have attraction between the elements AO and DO of the current, and between OC and ON, and repulsion between AO and OC, and between DO and ON. Accordingly, if conductor AB were fixed, and DO movable, the latter would turn round on its axis, or, till it lay parallel to the former, with both currents in the same direction. An interesting instance of these laws is the production of continuous rotation by a circular current. Suppose we have a current flowing round a circle, and also a current flowing along OA from the centre outwards, as shown in fig. 15. Then, by law 3, OA would be attracted on one side and repelled on the other, and these forces would assist each other in making OA sweep round the circle in the opposite direction to that of the circular current. If we arrange a circular trough round the edge of

Fig. 15.



been constructed by Mr. Ferranti on this plan of continuous rotation. The wire in circling round sets in motion a train of wheels, which are furnished with hands and dials just like those of a common gas meter.

*Theoretical Measurements.* According to Ohm's law  $C = \frac{E}{R}$ , and so, if we have convenient methods of measuring E and R, the measurement of C is very simple. In

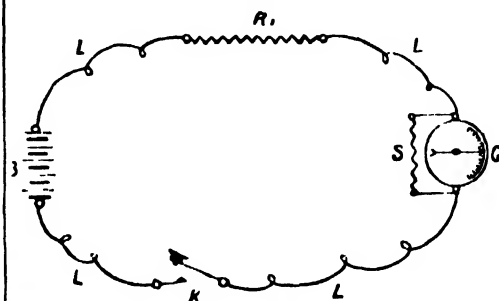
fig. 16 we have a typical circuit, where B represents the battery of five cells in series, G the galvanometer, R an unknown resistance, L, L, L the connecting wires or leads,

and K a key for completing and breaking the circuit at will. Then the total E.M.F. is the sum of the electromotive forces of the cells, and the total resistance is the sum of the various resistances; therefore

$$C = \frac{E}{R + B + G},$$

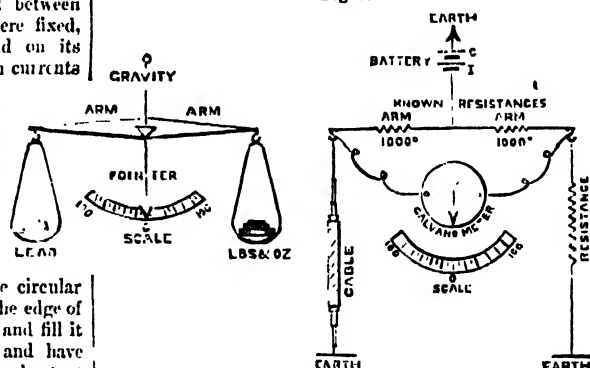
where B is the internal resistance of the battery, and G that of the galvanometer coils. As the leads are short, thick wires, their resistance may be neglected.

Fig. 16.



1. *Measurement of Resistance.*—We may measure an unknown resistance in various ways:—(a) We may compare it with some other resistance by means of a tangent galvanometer, in which, as has been shown, the current is propor-

Fig. 17.



tional to the tangent of the angle of deflection. First, join up the unknown resistance in circuit with a battery and tangent galvanometer (as shown above), and note the deflection,  $\delta_1$ . Now substitute for  $R_1$  some known resistance,  $R_2$ , and again note the deflection,  $\delta_2$ . Then  $\tan \delta_1 : \tan \delta_2 :: R_2 : R_1$ . If such a galvanometer is not available, any one will do, if we vary our known resistance till we get the same deflection in both cases. Then  $R_2 = R_1$ . (b) A much better plan, however, is to employ a set of standard resistance-coils on the principle of the Wheatstone's bridge. This apparatus, invented by Christie, and applied by Wheatstone to measure resistance, is also known by the name of the electrician's balance. We shall use the illustration of an ordinary balance to make the principle clear. Suppose we wish to ascertain the weight of a piece of lead (see fig. 17). We put it into one pan of the scales, and into the other we place weights until the pointer is at zero on the scale, that is, until there is not the slightest difference of level between the arms of the scale. If now we wish to find the resistance of (say) a submarine cable, we make an analogous balance, with equal resistances, for the equal arms of the scale, and we vary the known resistance until the galvano-

meter shows no deflection. Then we have established a balance as before: for had there been the slightest difference of potential (or pressure) between the ends of the arms of our electric balance, there would have been a current in one direction or the other through the galvanometer, which would have caused the needle to deflect from zero. Then, suppose on examining  $R$  we find it is  $750\ \Omega$  (ohms), we know that the resistance of the cable is also  $750\ \Omega$ . But as in an ordinary balance it is not essential to have the arms equal so long as we know the ratio between them, so is it in the electrical balance, for the fall of potential through a circuit is equal for equal resistances, or is proportional to the resistance overcome. Thus, referring to fig. 16, suppose  $B = 10\ \Omega$ ,  $G = 50\ \Omega$ , and  $R = 40\ \Omega$ , while  $E = 5$  volts. The total resistance is  $100\ \Omega$ , of which  $B = \frac{1}{10}$ ,  $G = \frac{5}{10}$ , and  $R = \frac{4}{10}$ . The

E.M.F. will fall through the battery  $\frac{1}{10}$  of 5 volts, or  $\frac{1}{2}$  a volt; through  $G$  it will fall  $\frac{5}{10}$  of 5 volts, or  $2\frac{1}{2}$  volts;

while through  $R$  it will fall  $\frac{4}{10}$  of 5 volts, or 2 volts; and the sum of these ( $\frac{1}{2} + 2\frac{1}{2} + 2$ ) is the total electromotive force or potential of the battery. Fig. 18

represents diagrammatically the system of conductors known as the Wheatstone bridge. They are represented as  $a$ ,  $b$ ,  $R$ , and  $x$ , and it is not by any absolute equality,

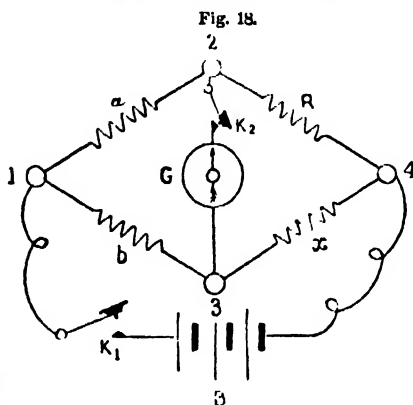
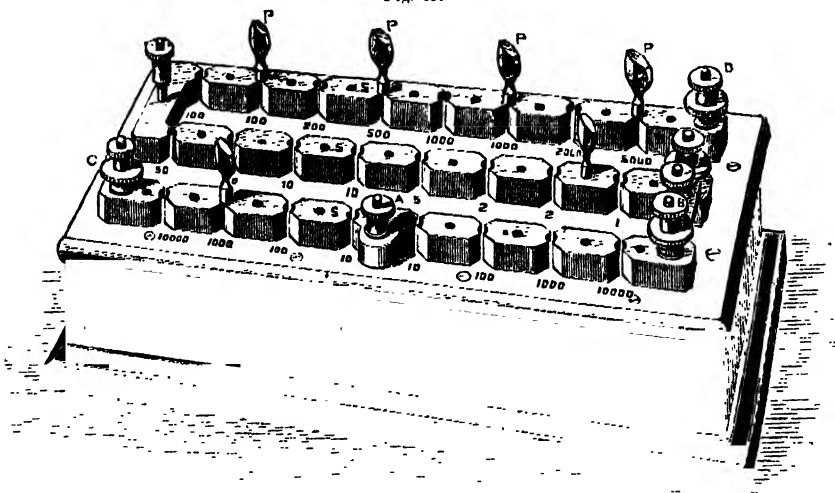


Fig. 18.

but by the proportion subsisting between them, that the resistance of any one can be calculated, provided the other three are known. A slight examination will show that

Fig. 19.



this figure and that of the electrical balance given above are identical, if the three earth points in the latter are joined directly together at point 4, as shown in fig. 18. Let us close the battery circuit by depressing  $K_1$ , and allow the current to flow. When it reaches point 1, it divides, part flowing through  $a$  and  $R$ , and part through  $b$  and  $x$ . These currents reunite at 4, and flow back to the battery. Suppose we first make  $a$  and  $b$  each  $10\ \Omega$ ; then, depressing  $K_2$ , we note if there is a deflection of the galvanometer needle. If there is, we must vary it until we have no deflection, whether  $K_2$  is open or closed, when, if it is  $90\ \Omega$ , we know that  $x$  must also be  $90\ \Omega$ . In arms  $a$  and  $b$  we have together  $100\ \Omega$ , and also in  $b$  and  $x$ ,  $100\ \Omega$ .

Of these,  $a$  and  $b$  are each equal to  $\frac{1}{10}$ ; therefore the

potential must have fallen  $\frac{1}{10}$  in flowing from points 1 to 2,

and from 1 to 3. For example, suppose the potential at 1 to be 10 volts, then at 2 it will be 9 volts. But at 3 it is also 9 volts; and as the galvanometer connects these

two points, there can be no current through it (and therefore no deflection of the needle), because there is no difference of potential between them. Suppose, however, we made  $a = 10$  and  $b = 100$ ; then if it is still  $90\ \Omega$ , we know that in this case  $x$  must be  $900\ \Omega$ ; for as  $\frac{1}{10}$  of 100, so 100 is  $\frac{1}{10}$  of 1000.

Thus we have the following proportion:—

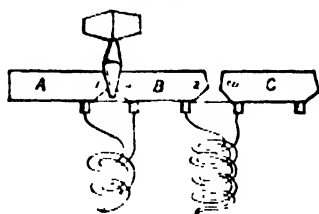
$$a : b :: R : x, \text{ and } a : R :: b : x; \text{ or } ax = bR;$$

$$\therefore x = \frac{b \times R}{a} = R \frac{b}{a}.$$

So long as this proportion does not subsist, there must be a current one way or the other through the galvanometer, which will be indicated by the deflection of the needle. This is known as a null or zero method of finding resistance. The three known variable resistances,  $a$ ,  $b$ , and  $R$ , are generally combined in the convenient form known as a resistance-box, one form of which is shown at fig. 19. It consists of a wooden box, furnished with a lid or cover

of ebonite, which is a good insulator. Along this cover are arranged rows of stout brass bars, with holes at regular intervals between them, into which are inserted well-fitting brass plugs with ebonite tops. Beneath the cover are the coils, made of silk-covered german-silver wire, each of which is equal exactly to a definite number of ohms, and has its ends soldered to two contiguous bars. Each coil is doubled so as to form a loop, as shown in fig. 20,

Fig. 20.



before being wound on a wooden bobbin. The whole is then dipped in melted paraffin-wax, so as to insure perfect insulation, and the ends soldered to the brass pieces, as shown. Suppose, now, the current has to get from A to C, it passes by the plug marked 1 ohm, from A to B; then it has to traverse the whole coil, marked 2 ohms, before reaching C, because the plug is out. Thus, by withdrawing plugs, we may insert any integral number of ohms, from one up to the limit of the capacity of the box, usually from 1 to 10,000 ohms. These boxes are also provided with brass screw-terminals, for connecting the battery, galvanometer, and unknown resistance, and in some cases with contact keys. For measuring very low resistances, the apparatus called the slide-wire or metre-bridge will be found useful. In this case the ratio  $\frac{R}{\sigma}$  is kept constant, while the ratio  $\frac{a}{b}$  is

changed, until it is equal to  $\frac{R}{\sigma}$ ; then  $\sigma$  is found by the formula already given.

There are many ways of finding the internal resistance of a battery, but we shall give the two most commonly adopted:—(a) By half-deflection method. Join up the battery whose resistance is to be measured (as shown in fig. 16), in circuit with a tangent galvanometer and a resistance box. With a resistance,  $R_1$  in circuit, note the deflection,  $\delta_1$ . Now, increase  $R_1$  to  $R_2$ , so that the tangent of the new deflection shall be one-half  $\tan \delta_1$ . Call this

$\delta_2$ ; then  $\frac{C_1}{G_2} = \frac{\tan \delta_1}{\tan \delta_2}$ . But when the current is halved, while the E.M.F. remains constant, we know that the total resistance of the circuit, or  $R_1 + B + G$ , must have been doubled; therefore,  $R_2 + B + G = 2(R_1 + B + G)$ . Transposing, we get  $B = R - (2R_1 + G)$ . Therefore by subtracting from  $R_2$  the sum of  $2R_1 + G$ , we find the resistance of the battery. (b) By Mance's method. Insert the battery whose resistance is wanted, at  $x$ , in the bridge diagram, as shown in woodcut, fig. 18. Now, adjust  $R$  till the deflection of the needle is the same, whether  $K_2$  is closed or open; then

$$B = \frac{R \times b}{a}.$$

2. *Measurement of Electro-motive Force.*—(a) By the most reliable instruments for measuring E.M.F., or difference of potential, are the electrometers of Sir William Thomson. Of these, the quadrant electrometer is the best known and most widely used, but as it is much too minute for description here, a brief statement of its chief parts must suffice. It consists essentially of a

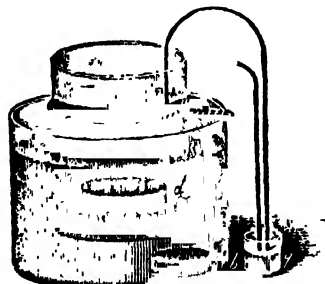
Leyden jar, having strong sulphuric acid for its inner coating, and strips of tinfoil, in electrical connection with the earth, for its outer coating. Inside is suspended a light needle, which hangs between four insulated conductors termed "quadrants," and is in electrical connection with the  $H_2SO_4$ , but is insulated from the tinfoil. First, the jar is charged by a spark from an electrophorus, and then by a small electrical machine or "replenisher," until the inner coating and the needle are at a very high potential compared with the earth, or outer coating. If, now, we connect the two insulating terminals (which are attached to opposite pairs of quadrants) to two points (such as the poles of a battery), between which there exists a difference of potential, the needle at once swings to one side, the deflection being noted as in the mirror galvanometer. Call this deflection  $d$ ; then, if  $k$  be the "constant" or deflection due to one volt, and  $E$  the difference of potential wanted, while  $V$  is the potential of the needle above that of the earth, then

$$d = k \times E \times V \therefore E = \frac{d}{k \times V}.$$

Since  $k$  and  $V$  are both constant for any particular set of tests we have  $E$  directly proportional to  $d$ .

(b) If a quadrant electrometer is not available, a very ready method of finding electro-motive force is that of substitution. This requires a standard cell whose E.M.F. is known and constant, when it is carefully made and handled. One of these, known as a standard Daniell, is represented in fig. 21. Failing such a cell, however, a newly set up Daniell cell of the ordinary type may be taken, the E.M.F. being reckoned as 1.07 volt. Join up the standard

Fig. 21.



cell in circuit with a tangent galvanometer, or any other in which the relation of the deflections is known, and with a high resistance, as in fig. 16. Note the deflection,  $\delta_1$ . Now substitute the battery whose E.M.F. is wanted, and again note the deflection,  $\delta_2$ . Call E.M.F. of standard cell,  $E_1$ , and the unknown E.M.F.,  $E_2$ . Then, if we are using a tangent galvanometer, whose scale is graduated in tangents,

$$E_1 : E_2 :: \delta_1 : \delta_2 \therefore E_2 = \frac{E_1 \times \delta_2}{\delta_1}.$$

(c) In Lacroix's method, the standard cell and the battery (or cell) under test are joined up, so that their E.M.F.'s oppose each other; and two sets of resistances in circuit with the two E.M.F.'s are so adjusted that the currents are equal and opposite, and we have no deflection on the galvanometer. Then  $E_1 : E_2 :: R_1 : R_2$ . In taking any of the foregoing measurements by a null or by an equal-deflection method, it is well to use a dead beat mirror galvanometer, such as the Thomson. Another capital instrument for the purpose is the Deprez-D'Arsonval mirror galvanometer, as manufactured by Mr. Jolin of Bristol, shown at fig. 5, Plate II. It consists of a light flat coil of insulated wire suspended by a wire between the legs of a strong horse-shoe magnet; the field in the neighbour-

hood of the coil being still further increased by the inductive effect of a piece of soft iron in the middle of the coil. Thus, when a current passes through the coil, it experiences a couple owing to the repulsions between the field due to the current and that of the magnet, which causes it to be deflected from its position. This couple is opposed by the torsion of the sustaining wire, and it almost immediately comes to rest. Hence it is called dead-beat.

3. *Measurement of Current.*—(a) For the measurement of such large currents and potential differences as are now used in electric lighting and the transmission of electrical power, special instruments have been devised by Sir William Thomson, Professors Ayrton and Perry, Mr. Crompton, Captain Cardew, and many others. They are called ampere-meters (ammeters) and voltmeters, and, for convenience, are generally made direct-reading. [See also article on **ELECTRIC METERS.**] Large currents may, however, be measured by any of the foregoing delicate galvanometers, if they are provided with a shunt, as shown at *s*, in fig. 16. To find what proportion the resistance of the shunt must bear to that of the galvanometer, one or two remarks must be made on *conductivity*. The conductivity of a wire is the reciprocal or converse of its resistance; so that if *r* be its resistance,  $\frac{1}{r}$  is its conductivity. Thus

if we have three conductors whose resistances are in the proportion of 1, 2, and 3, their conductivities will be in the proportion of  $1, \frac{1}{2}, \frac{1}{3}$ ; or, twice as much current will pass through the first as through the second, and three times as much as through the third, if the wires are joined together in parallel, as shown in fig. 22. Suppose now we wish only one-tenth of our current to pass through the galvanometer and nine-tenths through the shunt, we must have the conductivity of the latter nine times as great as that of the former; that is, we must have its resistance only one-ninth as great. Hence with a one-ninth shunt, one-tenth of the current passes through G; with a one-ninety-ninth shunt, one-hundredth through G, and so on. Then, if we multiply the current strength in the galvanometer by 10 or by 100, as the case may be, we find the total current in the circuit. (b) A very sure way of measuring current strength, and one much adopted in

Fig. 22.

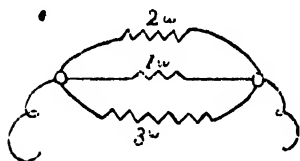
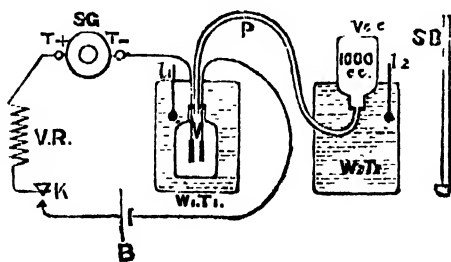


Fig. 23.



graduating galvanometers, is by *electrolysis*. Let us join up, as in fig. 23, between the battery and the galvanometer, a suitable electrolytic cell, and keep the current on for (say) ten minutes, taking care to adjust V.R., the variable resistance, constantly, so that there shall be a steady deflection on the galvanometer. Then the current may be found by applying the laws and formulæ given in the article on **ELECTRO-CHEMISTRY**. A shunt may be used in this

case also, as is done in Edison's meter for registering quantity of electricity, where a small known fraction of the current passes through a cell containing two plates of copper in a solution of copper sulphate.

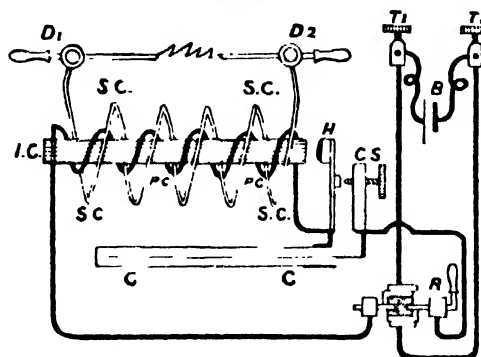
*Current Induction: I. By Currents.*—The phenomena of the induction of currents by currents and by magnets were discovered and first investigated by Faraday, and form perhaps the most interesting, as well as the most valuable, branch of voltaic electricity. Suppose we take two coils of insulated wire (fig. 6, Plate II.), the smaller of which, *n*, is of few turns and is connected to a battery, while the larger, *A*, is of many turns and has its ends joined to a galvanometer. If, now, we insert the smaller coil (called the primary coil), while a current is flowing, into the larger one (the secondary coil), we shall see the needle of the galvanometer making a swing, proving that a current passed through it; or *vice-versâ*, the smaller or primary coil may be connected with the battery, and the secondary coil with a galvanometer. Let the coil remain inside till the needle has come to rest, and then suddenly withdraw it; and at once the needle gives another swing, but in the opposite direction, showing that another brief wave of current has passed through the secondary coil. These are what are called *induced currents*, and it would be easy to show, by means of suitable apparatus, that the first current through the secondary was in the opposite direction to that in the primary, or an inverse current, while the second momentary induced current flowed in the same direction round the secondary as that in the primary, or a direct current. Sometimes the direction of the inverse current is called negative, and the direction of the other positive. Now, insert the primary into the secondary while no current is flowing; suddenly make or complete the circuit, and as suddenly break the circuit, and the same phenomena occur. The same effects are obtained, too, when the current in the primary is strengthened and weakened while lying in, or very near to, the secondary; but the nearer the coils are to each other, the better are the results obtained. These results may be thus summed up:—

A momentary inverse current is created in the secondary by that in the primary, by (1) approach, (2) making circuit, (3) increasing the strength of the current; while a momentary direct current is induced in the secondary, by (1) withdrawal, (2) breaking circuit, (3) decreasing the strength of the primary current.

A constant succession of these induction currents may be obtained by the use of an induction coil, invented by Mason and improved by Ruhmkorff, such as is shown diagrammatically at fig. 24. It is a hammer of soft iron, which vibrates backwards and forwards between the iron core, and *c* is a platinum-tipped contact screw in the primary circuit. The primary coil, *p.c.*, is of stout wire and few turns, so as to have low resistance and allow of as large a current as possible; the central iron core is for concentrating the lines of force due to the current, on the coils; while the secondary coil, *s.c.*, is of many turns of fine wire of very high resistance, so as to embrace as many lines of force as possible, and thus increase the effect. When the current flows round the primary coil the core becomes a strong magnet. This attracts the iron hammer, *H*, which flies up against it with a click, and breaks the circuit. At once a current flows through the secondary coil, which shows itself in a torrent of brilliant sparks between the dischargers, *D*, and *D*, fitted to the ends of the secondary coil. The attraction of the hammer, however, breaks the circuit, and another induced current flows round the secondary coil. As soon as the circuit is broken the iron core loses its magnetism; and the hammer, being now free, springs back to its former position, and once more makes contact. This goes on as long as we choose, the hammer vibrating backwards and forwards very many times in a second. Attached to the primary coil is usually a small condenser, *c* [see **ELC.**]

TRICITY], made of alternate layers of tinfoil and mica, or paraffined paper, into which the current flows every time the circuit is interrupted. This serves to make the break

Fig. 24.




Connections of Induction Coil.

- $T_1, T_2$  = Terminals to which wires from battery are attached.  
 $B$  = Battery.  
 $K$  = Reverser or commutator, for reversing or cutting off current.  
 $C.S.$  = Contact screw, platinum-pointed (in primary circuit).  
 $H$  = Hammer, soft iron, the movement of which completes and breaks circuit at  $C.S.$   
 $C$  = Condenser for arresting the momentary direct induced current in  
 $P.C.$  = Primary coil of thick wire, through which battery current passes.  
 $S.C.$  = Secondary coil of fine wire (well insulated), in which sparking currents are induced.  
 $S.D.$  = Spark dischargers fitted to ends of secondary coil.  
 $C$  = Iron core, being a bundle of very soft iron wires.

not, suddenly, by preventing the spark of the extra-current from leaping across the interrupter; and it also serves to keep up a store of electricity, so that when the circuit is again made its effect may neutralize the self-inductive action of the current of making it rise to its full strength again, by instead of suddenly.

In the large induction coil made for the late Mr. Spottiswood, the secondary coil was 280 miles long, while the primary was about one-third of a mile. By disconnecting the latter or the condenser, and sending into the primary the alternating currents of a small De Meritens magneto-machine, he was enabled to obtain sparks more than 10 inches long in air. Not only do coils carrying currents thus act inductively on neighbouring coils, but they also induce currents in themselves (each coil acting on its neighbour) every time the circuit is made or broken. This property is called *self-induction*. Referring to what has been said at the beginning of this section, on making circuit, we should have a momentary inverse current circulating in the primary coil, just as if the current placed an obstacle in the way of its own progress in the act of being called into existence. This, however, has only the effect of preventing the current from at once attaining its full strength. On breaking circuit, however, we have an induced direct current, as if, at the instant of stopping, the current gave us a push forward to leap the gap. This is known as the "extra current," and, besides causing loss of energy, it manifests itself as a destructive spark, owing to its very high E.M.F. A small induction coil is often used for blasting purposes; the discharging points being placed among some inflammable material, in the middle of the gunpowder. Generally the E.M.F. of the induced current is enormously higher than that of the inducing current, but the quantity carried is as much less. This is because the resistance of the primary is low, while that of the secondary is high. If we choose, we may make the apparatus reversible, with

a long, fine primary, and a short secondary of low resistance. If, now, we send into the primary small currents of very high E.M.F., we get from the secondary large currents of low E.M.F. This fact is very important as bearing on a form of distribution of electricity for electric lighting, which has recently sprung into prominence—viz., by means of transformers or secondary generators. We may supply electricity over large areas and at considerable distances, in two forms—either as a small current of high E.M.F. or as a large current of low E.M.F. As we shall see presently, one difficulty which presents itself in the latter case is the very large and costly conductors which would be required for strong currents. In the former case, again, while this difficulty is absent, another crops up—viz., that the Board of Trade limit of E.M.F. for domestic lighting is 200 volts. The matter is compromised thus (Plate III., fig. 1):—A large alternating-current dynamo, capable of giving, say, 300 amperes of current, at an E.M.F. of 100 volts, is placed, along with a large transformer, at the central station. This gives for the total power of the dynamo  $300 \times 100 = 30,000$  watts. We wish to transform this for long-distance distribution into, say, a current of 10 amperes at a certain high potential. If there were no loss in the conversion we should have the full power given back by the transformer. But allowing for a loss of 10 per cent., this would give us back 27,000 watts. Then, if we divide 27,000 by 10, we find 2700 volts for the new E.M.F. The alternating currents are passed directly into the large transformer, having a low-resistance primary, and a high-resistance secondary coil, arranged in such a proportion of turns as to give the desired result. When the currents arrive at the houses they must be re-transformed into low potential currents, by smaller transformers. These are

represented thus,  (with a fine primary, and stout

secondary), connected in parallel in an arrangement which experience has shown to be the best, because the most regular and constant. Here, again, we may assume 10 per cent. of loss, which gives us an effective power of about 24,300 watts. In the houses we wish the current to have an E.M.F. of only 80 volts, say, and 24,300 watts divided by 80 gives a current of 304 amperes—sufficient to supply about 400 sixteen to twenty candle-power incandescent lamps. It is in this direction that we must look for future developments of the distribution of electricity on a large scale over wide areas for domestic lighting.

In 1835 Faraday discovered that the magnetic resistance of the iron core was much less—and consequently the inductive effect much greater—if it was made in the form of a ring or other closed magnetic circuit, so as to have no free poles, than if it was a straight bar. Induction coils, as applied in secondary generators, have undergone considerable modifications. Bundles of oxidized iron wire were at first used so as to minimize the wasteful Foucault induction currents in the core. [See *Induction by Magnets*.] Then the positions of iron and copper were reversed, the two coils being wound first, and then enveloped in an iron sheath. Modern transformers, such as those represented in figs. 2 and 3, Plate III., are simply a collection of these individual induction coils, for the sake of compactness and increased effects. Fig. 2 represents Kennedy's large central-station transformer for raising the potential. The coils are surrounded by a sheath of hoop iron, the left-hand part of the cut showing in section the stout primary and thin secondary coils. Fig. 3 shows a smaller transformer, for lowering the E.M.F. at the houses, made in a somewhat different form, but on the very same principle. What is perhaps the latest development of this important apparatus is shown at fig. 4 in section. The following description is extracted from the specification of Messrs. Dick and Kennedy, dated 2nd October, 1887:—

"Claim: a transformer of alternating currents of electric energy, for transforming currents of high potential into currents of low potential, and *vice versa*, comprising a shuttle or double T-shaped core or internal magnetic soft iron portion, either made solid or of thin insulated plates, having coils of primary and secondary conductors wound round it, and surrounded by an outer wire sheathing."

**II. Induction by Magnets.**—If, instead of a primary coil, we were to insert a bar magnet inside our secondary coil, we should have opposite currents induced during the insertion and withdrawal of the magnet similar to those already observed. If we insert in our secondary coil a plug of soft iron, we can have an exalted effect by moving about our bar magnet in the vicinity of the coil, owing to the concentrative power of the iron. The foregoing facts about the induction of currents, both by currents and by magnets, may be briefly summed up in the following laws:—1. There must be such a relation between the primary and secondary coils, or between the magnet and the coil, as will cause a varying number of lines of force of the former to be embraced by the latter. 2. A decrease in the number of lines of force included induces a current in the positive direction (a direct current), and *vice versa*. 3. The total induced E.M.F. is equal to the rate of change in the number of such lines of force. 4. In all cases the induced currents have such a direction that their reaction tends to stop the motion which produces them. To show the truth of this last law, which really sums up the others and is known as Lenz's law, a brief examination of the accompanying figs., 25, 26, will suffice. Suppose the coil in circuit

Fig. 25.

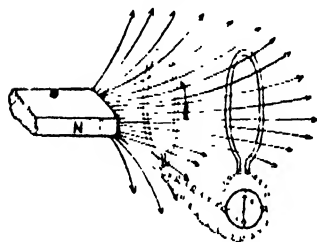
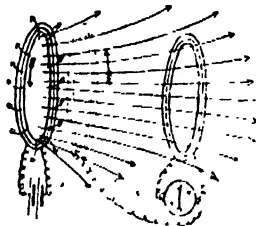


Fig. 26.



with the galvanometer to be brought nearer to the magnet-pole, or to the primary coil; then that which induces a current in each is the motion in such a direction as to cause a change in the number of lines of force passing through it; and, according to Lenz's law, this induced current must be in such a direction as to tend to stop this motion, or to cause repulsion of the approaching coil. Now, by the laws given above [see *Electro-magnetics and Electro-dynamics*], the current must flow in such a direction as to create similar polarity in the face of the coil next the magnet, or to flow in the opposite direction to that of the inducing parallel current. This is indicated in each case by the direction of the arrows. An interesting instance of the truth of this law is to be found in the device adopted for bringing a swinging galvanometer needle quickly to rest, of fixing underneath it a flat disc of copper. The currents induced in the copper by the swinging of the magnetic needle act as a powerful drag; and their tendency to stop this motion is shown by the short time which the needle takes to come to rest.

A dynamo may be defined as a machine which, by mechanical means, causes that relative motion between a magnet and a coil which is requisite for the production of currents; or a machine which converts energy from a dynamical to an electrical form. The essential parts of a dynamo are a magnet, with a closed conductor revolved by mechanical means in the field between its poles. This is represented at fig. 9, Plate I. **ELECTRIC LIGHTING.**

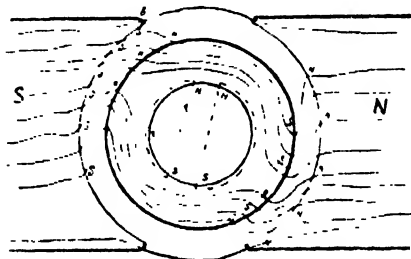
The revolving conductor is known as an armature, because it takes up the lines of force passing from pole to pole. If we have two, four, eight, or more such conductors suitably connected together (see fig. 10, same Plate), we have induction going on in all at the same time, and the currents are greatly increased. These currents, however, are alternating in direction, and in order to make their direction constant a commutator or current reverser, like that shown at figs. 11 and 12, same Plate, is employed. This consists of a number of hard copper bars, fixed round the circumference of a wooden hub on the armature spindle, each one of which is electrically connected with a separate coil of the armature, but is insulated from the neighbouring bars. On the commutator press two flat bundles of copper wire (or it may be flat strips of copper), called brushes, whose duty it is to convey the currents from the commutator segments, just as their direction is about to change, and thus lead them round the circuit in one constant direction. At first permanent steel magnets were employed, as they still are in the small magneto-machines used for "shocking" purposes, and in the large De Meritens machines used at the Isle of May and other important lighthouses. Sometimes the coils are fixed and the magnet revolves, as in Pixii's machine, and sometimes the reverse, as in Clarke's and De Meritens'. Then it was discovered that soft iron electro-magnets were much superior to the permanent magnets, and that they retained a very little residual magnetism, but sufficient to start a feeble current in the armature coils. This was first practically applied by Gramme, whose machine is shown in

diagram form at fig. 12, Plate I. **ELECTRIC LIGHTING.** A dynamo for furnishing alternate currents is shown at fig. 5, Plate III. It is of the type made and used by Mr. Rankin Kennedy, in connection with his transformer system of lighting already explained. It consists of two semicircular frames of cast-iron, having a large number of projecting cylindrical iron bars all round the outer edge. These are the field magnet cores, and they are so wound with insulated wire as to have alternate polarity between every two neighbouring poles, and between every two opposite ones. An iron frame, having similar bolbins on each side of it (shown at fig. 5a, Plate III.), revolves between these magnets and forms the armature. Of course such machines are not self-exciting, and require another constant-current machine working alongside to keep up the strength of the magnetic field (see fig. 1). In self-exciting machines of the "series" type the whole current, as it leaves the armature, is sent round the field magnets—hence the name, *self-exciting*. In what is known as the "shunt" dynamo the leads of the main circuit are joined directly to the armature, and the field magnets are excited by a portion only of the current, by means of a wire whose resistance is generally two to three hundred times that of the armature coils, joined across the main terminals as a shunt. Neither of these machines is self-regulating, for in the former the E.M.F. falls off as the outside resistance is increased (by the addition of lamps in series or the extinction of lamps in parallel), while in the latter the conditions are reversed. The "compound-wound" dynamo, in which both main and shunt currents pass round the field magnets, is almost perfectly self-regulating when properly proportioned, for as the one current falls off the other increases, thus maintaining a constant field and E.M.F. Two of the best of these modern dynamos, the Edison-Hopkinson and the Manchester, as manufactured by Mather & Platt, are represented at figs. 7 and 8, Plate II. The field magnet and armature cores, as well as the pole-pieces of the best modern "compound-wound" dynamos, are made of annealed wrought iron, while the yoke or tail-

piece joining the field magnet cores is of annealed cast iron, in order to retain sufficient residual magnetism to start the self-exciting current. The armature core should be built up of thin iron plates or laminations, insulated from each other, to prevent the formation of eddy or Foucault currents (so called from their discoverer), which the reaction of the current induces in solid masses of metal. These eddy currents cause a great loss of energy, so much so, that while the old Brush dynamo, with its solid cast-iron armature core, could light at most sixteen 1000 candle-power arc lamps, the new machine, with a laminated wrought-iron armature, but dimensions exactly the same, can easily run twenty-five lamps.

The magnetism from the pole-pieces of a dynamo magnetizes the armature core horizontally, while the current tends to magnetize it vertically. As it is just at this vertical diameter, or diameter of commutation, that the currents are changing their direction, this is where we ought to place our brushes if there were no reaction of the magnetism of the armature on that of the field. But that there is such a reaction may be gathered from fig. 27,

Fig. 27.



where the lines of force, instead of passing horizontally through the core of the armature, are, as it were, dragged round, and the magnetism seems to be heaped up at the opposite corners. This of course causes the diameter of commutation to shift round towards the right, so as to make an angle with the vertical diameter; and it is at the extraneous lines of this new diameter that we must place our brushes. This angle is called "the lead," and is greater the greater the magnetic reaction. To reduce this lead of the brushes the strength of the field's magnetism must be very much greater than that due to the current passing through the armature coils. The reader will have observed that, as far as the collection of the current is concerned, the terms *armature* and *commutator* are synonymous, which will account for what may seem an unnecessary use of the former term. For further information on this subject the reader is referred to the article on ELECTRIC LIGHTING.

**Heat and Work of the Current.**—In every case where a current does work—whether chemical, magnetic, mechanical, or thermal—that work is done by the expenditure of part of the energy of the current. The development of heat by a current was investigated by Joule and Lenz, by means of very accurate apparatus; and later, Favre, by comparing the amount of heat developed in a battery when doing no work with that developed when the current was doing a certain known amount of work, established the truth of the mechanical theory of heat in the case of the voltaic current. It was found that the heat developed is proportional to the quantity of electricity that passes, and to the pressure which drives it, or  $H = E \times Q$ . As  $Q = C \times t$  (where  $t$  is the time in seconds),  $H = E \times C \times t$ . But  $E = C \times R$ . Therefore  $H = C \times C \times R \times t = C^2 R t$ . Favre's experiments established the important truth, that the heat developed in a battery is the exact equivalent of the work

done by the chemical forces. All metallic conductors have their resistance increased by a rise in temperature, while the resistance of carbon decreases. This fact, together with its infusibility, makes carbon especially valuable in electric lighting. The elevation of temperature in a wire depends on its specific resistance and on its dimensions. A short length of very fine wire may have the same resistance as a long piece of stout wire. If they are joined end to end, in series with a battery, each will cause the same number of heat units to be evolved; but in the former case, as the heat is spent in warming a very small mass of metal, it will get extremely hot, while in the latter case the current may not even warm it perceptibly. Suppose we take two wires of equal length and thickness, one of pure copper the other of platinum, join them in that manner, and send a current through them; the former will keep quite cool, while the latter may become red-hot. This is because the specific resistance of platinum is six times as great as that of copper, while it has only about one-half the capacity for heat. Hence the rise of temperature in the two cases will be, roughly, as one is to twelve. For certain surgical operations a thin platinum wire, made white hot by a current, is used, because it acts at once as a knife and as a cautery. Referring to what was said above in connection with transformers, we now see why it is so much more economical in conductors to work with small currents than with large ones. If we try to send a current through a conductor whose resistance is too great, the temperature will rise, destroy the insulation, and perhaps cause damage by fire. We can get the same amount of work from 10 amperes at 5000 volts as we can from 500 amperes at 100 volts; but as the cost of a copper conductor in the latter case would be about fifty times what it is in the former (owing to the large conductors we must use for such a large current), this becomes a matter of first importance when the distribution has to be made over a considerable district. See also ELECTRIC LIGHTING.

**Transmission of Power.**—As by means of a dynamo or a battery we can transform energy from a mechanical or a chemical form into an electrical form, so by an *electro-motor* we are enabled to re-transform the energy back to its mechanical form. In 1823 Sturgeon discovered that if a copper disc be set between the poles of a magnet, and a current be sent from its centre to its circumference, it will immediately begin to revolve. The discovery rested there for many years, and subsequent inventors, such as Jacobi, Bourbouze, and Froment, constructed what were termed electro-magnetic engines, which depended for their motive power on the magnetic attractions and repulsions of masses of soft iron. At the Vienna Exhibition of 1873 it was discovered (some say experimentally, and some accidentally) by M. Hippolyte Fontaine, that if the current generated by a Gramme dynamo machine were sent through another similar machine "the other way round"—that is, first round the field magnets, then through the armature, and back to the generator—the armature of the second dynamo revolved at a great speed. Machines constructed on this principle and for this purpose are known as electro-motors, and have greatly widened the field of operation for the transmission of power. Thus we may have in a city a large central generating depot, and may deliver to all sorts of small users of power from a half, or even a quarter, of a horsepower upwards. We can transmit the current for miles along conductors, and then transform it as we find most practicable. By means of electro-motors men now discharge torpedos, propel boats, cars, and trains, and work lathes, cranes, pumps in mines, and machinery of all kinds. A well-made dynamo always makes an efficient electro-motor, though the converse does not hold true. If we join up a galvanometer in the circuit of a dynamo and motor, and vary the load on the latter, we shall find that the current falls off as the speed increases; and if we allow the motor



to spin round very fast, the galvanometer will show hardly any deflection at all. This is owing to the fact that in revolving the armature of the motor it generates a current of its own, and as this, in accordance with Lenz's law, must be a counter-current, its effect is to reduce that of the generator. The faster the armature of the electro-motor spins round, the higher grows this E.M.F. of reaction. If we call  $E$  the E.M.F. of the generator, and  $e$  that of the motor, then the effective electro-motive force is  $E - e$ , and the current will be  $\frac{E - e}{R}$ , where  $R$  represents the total resistance of the circuit. It could be demonstrated that the motor is doing maximum work when  $\frac{E - e}{R} = \frac{1}{2}$  of  $\frac{E}{R}$ ,

and that it is working with maximum efficiency, or is turning the largest percentage of the current into useful work, when  $\frac{E - e}{R}$  is as small as possible. It is therefore a matter

of choice or of the circumstances of the particular application of the motor, whether we should take the maximum work or obtain the maximum efficiency out of it. In Geneva at the present time the municipal authorities are arranging to distribute power by this means to the large numbers of small tradesmen who prefer to do their work at home instead of congregating in a factory. The same project is being mooted in this country, and in America it has assumed the proportions of a large and paying business. Wherever a constant and large supply of water power is available at a convenient centre to drive the generators, then power may be distributed throughout the surrounding neighbourhood more easily and cheaply by electric motors than by any other means. It also appears to be only a question of time when we may expect to find large electric generating plants at our different collieries, and the power transmitted by small copper conductors to motors in the surrounding villages and towns.

**VOLTAIRE, FRANÇOIS MARIE AROUET DE**, was born at Châtouay, near Senaux, on the 20th of February, 1694. The name of Voltaire he adopted in his later life from some patrimonial property, as some say, or as others allege (with perhaps greater probability), from pure fancy, constructing it by an anagram upon his own name, AROUET L(e) I(c)onne, i.e. Arouet Junior. His family name was Arouet, and his father was a treasurer of local revenues; his mother, Marguerite Aumart, a noble Poitevin lady. At his birth he was so frail that his baptism was delayed for some months, but as he grew older he became somewhat stronger, though always remaining very feeble in health; and by virtue of careful dietary and a mind always healthily active, he preserved his life even beyond the normal span. He was a second son, but his father was rich enough to provide him with a good education, and under the tutors of a Jesuit college (Louis le Grand) he acquired a considerable knowledge of the principal branches of learning, though he always declared he learnt little there. He shocked the good fathers to such an extent by his daring speculations that one of them made himself famous by predicting that he would become the Corypheus of deism.

Voltaire's godfather, the Abbé Chateaufeuf, introduced him to society. His wit and ability secured him a ready welcome from the literary *salons* of Paris, where he found himself in company with those whose abhorrence of the licentious hypocrisy of the court, and whose hatred of the slavish subservience and worldly greed of the church, drove them into the ranks of atheism. Ninon de l'Enclos, now very old, took a great fancy to the lad, helped him much, and when she died left him a legacy to buy books. Voltaire matriculated and became an *arçat*, but spent his time on verses and gay society instead of over law books. Alarmed at the "fast" career of his son, M. Arouet procured him a post in the suite of the Marquis de Chateaufeuf, ambassador at

the Hague. Here the impressionable young wit fell in love, and the attachment being imprudent, he was recalled to Paris.

One of the numerous satires flung, instead of immortelles, upon the tomb of the Grand Monarque, who had died in the "odour of popular antipathy," was attributed to the keen, sceptical, audacious Arouet, and though no proof was adduced, he was committed to the Bastille. He availed himself of this seclusion to give a definite form and shape to many of his literary projects.

Having been released through the good offices of the Duc d'Orléans he gave to the world his first tragedy, "*Edipus*," in 1718. Its success was sufficient to encourage him in the path he had chosen, while a couplet, much approved by the people, provoked that bitter hatred on the part of the priesthood which pursued him through life, and followed him to the grave. The cause of so dire an animosity was as follows:—

"Nos prêtres ne sont pas ce qu'un vain peuple pense;  
Notre crédulité fait toute leur science."

("Our priests are not what the silly multitude think them; all their wisdom lies in our credulity.")

In 1722 Voltaire, as he now began to call himself, visited Holland, and on his route made the acquaintance of Jean Jacques Rousseau. There was little in common between the two philosophers, except a vague idea of deism and an antipathy to the orthodox; and we marvel not that they soon grew jealous of each other, the jealousy on Rousseau's part descending to a hatred which seized every opportunity of showing itself.

In 1724 appeared the first (an imperfect, and it may be an unauthorized) edition of the "*Henriade*," under the title of "*The League*." It was the first epic poem which French literature had known, and it is perhaps the greatest which it has produced. It abounds in sonorous passages of elevated morality. The diction is always correct, and often eloquent. But it wants that poetic light "which never was on land or sea," but which lives in the soul of the true poet. It is fatally correct and judiciously lifeless. Revised by the author, it was reproduced in London in 1728, and dedicated to Queen Caroline, wife of George II.

Voltaire was at this time a social lion. His marvellous talent and his fine manners carried him everywhere. But aristocratic stupidity occasionally asserted the ignoble pride of birth, and a certain De Rohan, insulting Voltaire, and receiving as usual a crushing answer, to the delight of the bystanders, was mean enough to set his footmen upon the young wit, and have him thrashed soundly, refusing afterwards to "give him satisfaction" on the field. Voltaire fought him, as the sword was refused, with epigrams ten times more wounding, and consequently got sent for a second time to the Bastille, and after six months' imprisonment was ordered to quit Paris. He found a refuge in England (1726), where he was cordially received by all its celebrities, where he profoundly studied the language and literature, and learned to appreciate Newton, Shaftesbury, Milton, Locke, Dryden, and Pope, to laugh at Hudibras, and even, after a sort, to dimly understand Shakespeare; and where he studied the principles of constitutional government with a bitter regret that he could not impart them to his countrymen.

He resided in England about three years, chiefly the guest of Mr. Falkener, at Wandsworth, and composed the tragedy of "*Brutus*," besides a tragedy in imitation of Shakespeare's "*Julius Cæsar*," which his good sense prevented him from producing on the stage. It was during his residence in this country that he completed his system of philosophical deism, which neither the arguments nor the ridicule of the atheists of the *Encyclopédie* could shake in his acceptance.

In Voltaire's times the only arena open to the literary athlete who had the courage to contest established pre-

judices and to controvert opinions recommended only by their antiquity, was the stage. Here Voltaire had no rival worthy of his prowess; and his tragedy of "Zaïre," composed, it is said, in little more than a fortnight, raised him to the very pinnacle of popular favour. His success was the more remarkable that he had ventured to despise the recognized canons of criticism, and had asserted the right of genius to make its own laws. For one thing, this was the first great play with French characters. Hitherto classical antiquity had provided all dramatic subjects, save in comedy. The dates of his most famous tragedies are these: "Œdipe," 1718; "Brutus," 1730; "Zaïre," 1732; "Mort de César," 1735; "Alzire," 1736; "Mahomet," 1741; "Mérope," 1743; "Sémiramis," 1748; and "Tancrède," 1760.

Voltaire, who had left France in 1726 an accomplished poet, and who had returned to her in 1729 a sage, imparted to his countrymen in his philosophical "Letters on the English" some of the priceless lessons of liberty we had the honour of teaching him. His letters were burnt by the hangman as a reward! Weighed by a long course of petty persecutions, he now resolved to betake himself to some secure asylum where he might develop his literary projects in tranquillity. He chose for his retreat the sweet village of Cirey, on the borders of Champagne and Lorraine, whither he accompanied a lady of literary and philosophical tastes, and some ability, the Marquise du Châtelet, who studied Leibnitz and swore by Newton. This connection, however, was by no means one of unmixt happiness—not that the marquis was, however, the cause of any discord, for he played throughout a most astonishingly friendly part. A scientific woman, deep in mathematics and physics, is perhaps not the best companion for a weary philosopher. "May a tempestuous day and wakeful night," as Carlyle puts it, "find him with that too-fascinating shrew. Like Queen Elizabeth, if she had the talents of a man, she had more than the caprices of a woman." Yet from 1733 to 1749 this endearment continued, and was in fact only terminated by the death of the marquise. Both the lady and Voltaire were incessant workers. Voltaire at this time was busy with scientific ardour, and gave much of his time to observation and experiment. He was only induced to desert by his friend Calvert, who assured him that in literature, and not in science, would his talents be of most use. However, as a result of his scientific years, he produced a popular explanation of Newton's recent discoveries in optics and astronomy. The system in vogue in France, and accepted by its learned bodies, was that of Descartes. Voltaire was, therefore, denied the license needed for the publication of his book. He turned from these thorny ways to the flowery paths of poetry, and revived his popularity by his tragedies of "Alzire," "Zaïre," and "Mahomet." He also began his "Essay on Man," and his admirable "History of Charles XII.," and commenced collecting materials for his "Siècle de Louis Quatorze" and his "Essai sur les Mœurs et l'Esprit des Nations."

While at Cirey he opened his long and famous correspondence with the Prince-royal of Prussia, afterwards Frederick the Great. The prince solicited the great writer's opinion on a composition which he had attempted in French. Voltaire eagerly embraced the friendship thus proffered. Frederick alone among the kings (or future kings) of the time was a lover of shams, and gave promise of inaugurating a new age. The admiration of each for the other was perhaps a little overacted, but was perfectly genuine. Moreover, Voltaire had been fired by the example of Bolingbroke, Addison, Prior, Swift, and Gay in England, and knew that he was better able to serve his country than those great English men of letters, all of whom were in active service to the state.

At an invitation from Frederick, Voltaire visited him at

Potsdam, but the friendship between the two barely survived the ordeal of personal intimacy. It was, however, the occasion of his being selected by the French court to undertake a mission of a confidential character at a later period, and in this he appears to have been tolerably successful. In 1746, through the influence of Madame de Pompadour, he obtained a chair in the French Academy; he was also appointed historiographer of France, and gentleman-in-ordinary of the king's chamber. In 1749 Voltaire, while staying with the ex-king of Poland at Luneville, lost his companion and congenial fellow-worker, the Marquise du Châtelet, who had previously engaged in an intrigue with a M. de Saint-Lambert, and died in childbirth, after a brief illness. Saint-Lambert was overwhelmed by Voltaire and by the widower with reproaches for the terrible evil he had done, all three sobbing together by the bedside of the dead Emilie in genuine abandonment of grief: surely as curious a scene as biography can show.

All these years were by no means spent peacefully in hard work at Cirey. On the other hand Voltaire, always in the thick of the fight against ignorance, tyranny, and superstition, and always being discovered though his disguises were infinite, often had to fly for his life, and appears at Paris, at the Hague, and elsewhere fitfully, sometimes also lying *perdu* for a season. At last, when persecution levelled at the daring wit its envenomed darts more fiercely than usual, he was glad to flee for an asylum to the court of Frederick at Berlin (1750). Here he was warmly welcomed; a pension and an order were bestowed upon him; he corrected the king's bad verses, and amused the royal leisure. Yet it was impossible that this unequal friendship should long endure. Despite Voltaire's levity and persillage, despite of his incessant attacks upon Christianity, he was capable of the keenest and most generous sympathies. He could pity the oppressed—he could feel for the destitute. He admired liberty, and had respect for virtue. Between him and Frederick of Prussia there was in fact an antagonism of character which could not long be repressed. The king grew angry, and the wit retaliated with sarcasms. At last Maupeituis was appointed by Frederick to organize the Berlin Academy, and Voltaire was seriously ruffled. Soon Maupeituis, who was very absurd and arbitrary, laid himself open to his formidable rival, and as "Doctor Akakia" was for ever held up to the laughter of mankind. His reputation, indeed, has never recovered. Frederick raged, and had the book burnt. Moreover, a saying of his reached Voltaire, that "when you have sucked an orange dry you throw away the skin." Voltaire determined upon quitting Prussia, but found it no easy matter to "save the skin." Every obstacle was thrown in his way by the indignant monarch, and at length he was arrested at Frankfurt, most illegally (for Frankfurt was a free town of the empire, and not in any way under Prussian authority), and moreover on a frivolous pretext. It was not until after many trials and much protocoling and correspondence that the philosopher effected his escape from the hands of *le roi philosophe* after a detention of five weeks (1753). Nevertheless it must be remembered that both men were royally great, Voltaire as the liberator of the human mind from the stifling grasp of an effete spiritual order, Frederick as the demolisher of an effete political order. Neither gained the precise victory he thought he did, but to both we have never-ending cause of gratitude. Their faults were those of their century, their grandeur was their own. Each of them was vain and irritable. Yet Frederick always honourably paid Voltaire his pension, even when it was difficult to know where to find the money.

During his residence in Prussia Voltaire completed his finest work, the "Siècle de Louis Quatorze," which, though disfigured by his antichristian prejudices, fully deserves the high reputation it has gained. The style is lucid as running water, the chain of events is linked together with

admirable skill, and so vigorous is the portraiture that the men of the age seem to act and move before the reader like things of life.

Perceiving that his return to Paris would be the signal for a fresh outburst on the part of his enemies, Voltaire eventually established himself, in 1760, at Ferney, near Lausanne, placing his household under the control of a widowed niece, Madame Denis. Here he distinguished himself by his generous efforts to save the victims of political and ecclesiastical hatred—such as Admiral Byng and the unfortunate Calas—and by a literary industry which gave to the world many valuable results. At this time he had resumed his correspondence with Frederick the Great, it being agreed that all past offences should be set aside; the Czarina Catharine II. of Russia was a constant writer, "if only he would not think her importunate;" Christian VII. of Denmark sends profuse apologies for the necessities which hinder him from more rapidly granting liberty to his subjects; Gustavus III. of Sweden gratefully acknowledges Voltaire's encouragement of his efforts; Joseph II. of Austria apologizes for his mother's anger, which prevented him from visiting Ferney. What enormous influence for one man to wield! In fact Voltaire was not only the foremost figure of the eighteenth century, he was rather the very century incarnate.

Personally, Voltaire was a better man than he appears in his writings—a better, a wiser, and a more consistent. Had he never written a line he would have come down to posterity as a practical philanthropist. A village of fifty peasant inhabitants was changed by him into the home of 1200 manufacturers. He is still traditionally remembered at Ferney as the father of the poor. As a man, he was vain, self-confident, wayward, irascible, kind-hearted, generous, and easily moved. His fault was that he was too human—that is, too weak and too unsteady. We must remember that in opposing religious opinion, he was opposing the opinion of monks and Jesuits, and fanaticism disconcerted him with Christianity. Observe the difference with which he speaks of the Protestant faith; with what gravity and respect. Had he been born in England, we doubt if Voltaire had ever attacked Christianity. He believed in a supreme being; at Ferney he even erected a church "to God;" unfortunately he did not exhibit this God as a loving and chastening divinity, with a real government of the universe and a profound sympathy for man, but as a philosophical abstraction which unrecognized humanity failed to worship. Of those who regard Voltaire as "atheistical" and the like, how many have read him? On the other hand how many of those few who have read him are able, by sufficient historical knowledge, to put themselves in his point of view, and to see the gigantic evils and the power, unassailed till then, against which this solitary hero waged war with his stone of ridicule and his sling of satire? The bulk of Englishmen know Voltaire only by the false caricature of him shrieked forth by a frightened priesthood, unable to meet him in argument or to contend with him in wit, and (at that time) not even able to vie with him in human kindness. Time has by no means abated their hate of him, for to this day France is practically divided into two parties—the party of the church and that of the free-thinkers; the latter, the direct children of Voltaire's mind, are more numerous, more distinguished, and more clever than their opponents. The defeat was gallant and is permanent. Unhappily, hitherto the policy of the church has been such as to hinder her converting the defeat into a victory, and France suffers from her ineptitude; for the Voltaires rest largely upon negations, and as our foremost contemporary English moralist has said, "Negation supplies no bond."

When Carlyle calls Voltaire the "grand persifleur," however, he wrongs the philosopher of Ferney. His "Candide" and his "Zadig" show that he could cherish

strong convictions; his daily life is evidence that he had deep feelings, and could act up to them. See his flaming words to D'Alembert in a private letter upon the infamies then being perpetrated in the name of religion at his very door. "What! these be-wigged ones to destroy, in the midst of horrible tortures, children of sixteen (La Barre), and that in the face of the verdict of ten humane judges! Here Calas broken on the wheel, there Sirven condemned to be hung, a fortnight later five youths condemned to the flames for boyish pranks! Ah, my friend, is it a time for laughing? Did men laugh when they saw Phalaris' bull being made red-hot?" Nor words alone; for the family of Calas, poor hunted Sirven, and others who escaped these blood-stained bigots were supported for life by the generous man at his own expense and on his estate. Not only that, but he worked for twelve years to get the sentences revised under which poor slaughtered men had innocently suffered, such as La Barre, D'Etallonde, and Lally, and though he failed in the first two and others also, he succeeded in the last, and received news of his triumph on his own deathbed. One man's memory, at least, he had rescued from shame. So tender was this man even to the dead! He said himself that in death one thought consoled him, "J'ai fait un peu de bien" (I have been able to do some few good actions).

Voltaire is often condemned for his "avarice." This is most unjust and untrue. He early saw the misery and the powerlessness of dependence, and he used his vast powers and knowledge of men to deal upon the stock exchange and amass a considerable fortune. By this means his independence was secured, and while he was never extravagant, he was able to do many signally generous actions, for only a very few of which we have found space.

Of the seclusion of Ferney, Madame Denis at length grew weary, and induced her uncle to return to Paris, where a complete ovation awaited him. Not that his enemies were fewer or less bitter; Jesuits and Jansenists, courtiers, the tools of a corrupt government, the adulators of a licentious monarch, still continued their loud-mouthed attacks. But his supporters had by this time become legion; the great body of the nation adored him as the high priest of a new philosophy, which was to insure a golden age of peace, enlightenment, and prosperity. Further than that, he was revered as the "protector of the Calas." So from Ferney to Paris his journey was a triumph; no conqueror returning from the battlefield where he had saved his country's honour could have received a more splendid welcome. His arrival in the capital created the greatest excitement. His levees were more crowded than the king's; his antechamber was thronged by princes and peers. When he went abroad his carriage was followed by a train of equipages, like the tail of a comet. He went to the theatre (La Comédie Française), and at the door the multitude welcomed him with shouts and acclamations. He occupied a box belonging to the gentlemen of the bedchamber, where he sat on the front seat. A cry arose of "La Couronne!" and Brizard, the actor, stepping forward, placed a garland on his head, contrasting strangely with his withered visage and eyes shining like carbuncles. "Ah, heaven, do you wish then to kill me!" he exclaimed, weeping with joy, and modestly resisting the honour. He took the crown in his hand, and presented it to the Marquise de Villette, a foster-child of his; she refused it, and the Prince de Beauvau, seizing the laurel, replaced it on the great writer's head.

The excitement proved too much for his enfeebled frame. This characteristically French scene occurred on the 30th of March, 1778, and on the 30th of May he was dead: the immediate cause a spitting of blood to which he had long been subject. Two days previous an attempt was made to reclaim him to the church which he had so consistently opposed and so bitterly satirized. His nephew,

M. l'Abbé Mignet, brought to the sick-room the curé of St. Sulpice and the Abbé Gantier, and informed him that they waited. "Ah, well," said he, "give them my compliments and my thanks!" The abbé addressed him in few words, exhorting him to patience. The curé of St. Sulpice then came forward, and raising his voice, inquired if he acknowledged the divinity of the Lord Jesus? The dying man pushed away the intrusively officious priest with the simple remark, "Let me die in peace" (*Laissez moi mourir en paix*).

He expired on the 30th, about a quarter past eleven at night, with the most perfect tranquillity, but after having endured extreme suffering through some drugs which he had imprudently taken. Two minutes before his last breath he took the hand of Morand, his valet-de-chambre, who was watching by him, pressed it, and said, *Adieu, mon cher Morand, je me meurs* ("Adieu, my dear Morand; I am dying").

It is difficult to signalize all the shifting lights of his varicoloured genius. He excelled in almost all things that men honour. As a poet he ranks next to Corneille and Racine in drama, and excels every writer in *vers de société*; in epic he is simply alone among Frenchmen. As a historian he was deficient in that subtle perception of character and profundity of thought which spell-bind the student in the immortal pages of Tacitus. Yet it is impossible to deny to his historical works the possession of considerable merits. To the general reader they are as fascinating as a romance. The method is consummate, the treatment masterly. His "Charles the Twelfth," for instance, is a model of that kind of biography; in fewest words are given the clearest details; and great men, great wars, great negotiations are all indicated by the briefest but most sparkling touches.

Admitting his excellence as a novelist, and that in his "Zadig" and "Candide" he shows marvellous powers of observation and invention, we have next to consider him as a polemic. Here, if we judge him by his success, we must rank him very highly, for the licentious abbé, the murderous *Écots*, the fanatic defenders of gross and ignorant superstition, the deceivers of the peasantry (they themselves being exempt from every penny of taxation), the priests who broke the Protestant Calas on the wheel for no crime, and on a false and unexamined charge, who put his wife and family to the torture, who attempted to murder Sirven and did actually beat his wife to death, who condemned a mere boy (La Barre) to have his tongue pulled out and his right hand chopped off, and then to be burned at the stake for a jest against the Virgin which he was never proved to have uttered, and who mercifully changed the punishment to decapitation upon appeal—these "infamous" creatures, as Voltaire justly called them, have, by his efforts, very largely been driven from the earth, never, we trust, to return.

But Voltaire was only successful where he was right; for, on the other hand, the Bible which he sneered at remains the Book of books. It is sometimes difficult to believe that he is earnest in his opposition; his very virulence seems occasionally artificial. Besides, though he makes fun of miracles, he never jests at the Sermon on the Mount. In all his polemical works he manifests himself ingenious and adroit, rather than noble or comprehensive; fights for truth or victory, not by patient meditation, but by light sarcasm.

A good life of Voltaire was a desideratum in English literature until the appearance of Mr. John Morley's "Life" in 1872, in a great measure supplied the void. Carlyle was ruminative, but most unsympathetic; examination of his genius and character will be found in the second volume of his "Miscellanies," and a very careful, though by no means accurate, account of the Berlin years is enshrined in the same great writer's "Frederick the Great." An interesting volume on his life and works is that of Colonel Hamley,

entitled "Voltaire" (London, 1877). The reader may also be referred to the "Vie de Voltaire, par M. le Marquis de Condorcet;" to "Mémoires sur Voltaire et sur ses Ouvrages, par Longchamps et Wagnière, ses Secrétaires," &c. (Paris, 1826); and to a sketch in Lord Brougham's "Philosophers of the Reign of George III."

The collected edition of Voltaire's works in French occupies seventy 8vo vols. (Paris, 1820). In English, an edition in thirty-five vols. appeared in 1761-69; and another, edited by Dr. Kenrick, in fifteen vols., in 1779-84. Of his separate works the translations are numerous, though very few are good. The "Henriade" was rendered into verse by C. L. Jones, 1834; "La Pucelle" (a poem which is a disgrace to Voltaire to have written, being a poor low-toned burlesque upon the noble career of Joan of Arc), by W. H. Ireland, 1822. The romances and histories may be obtained in numerous shapes; the latter, particularly those of Charles XII. and Louis XIV., have been eminently popular in England as school-books, for which purpose their elegant and lucid style admirably adapts them.

**VOLTAMETER**, an instrument employed either as a comparative standard of effect, or as a positive measure of the quantity of the voltaic current passing through it. It consists of a graduated glass tube, closed at one end, inverted over a glass vessel, so that the open end of the glass tube incloses two platinum foil strips in connection with the "poles" or terminal plates of the battery. When the apparatus is in use, the tube and vessel are filled with water acidulated with sulphuric acid. If the battery current be then passed through the water, the liquid will be decomposed and the evolved gas collected in the tube; the oxygen is separated at the wire connected with the copper, and the hydrogen at that connected with the zinc pole of the battery. The amount of decomposition, or quantity of gas produced, depends upon the quantity of current passing from the battery through the acidulated water in a given time; and as the liquid is decomposed in a quantity exactly proportionate to the quantity of the current which passes through it, the graduated tube becomes an accurate measure of the quantity of electricity produced.

**VOLTERRA, DANIELE DA**, the popular name of *Daniele Ricciarelli*, a painter of merit, who was born at Volterra in 1509. He became the friend and assistant of Michelangelo, and painted some of the great Florentine designs; as for example, the "David and Goliath" in the Louvre. Latterly Daniele turned his attention principally to sculpture. His masterpiece in painting is the "Taking down from the Cross," a fresco still in the Church of the Trinità de' Monti, and well known from engravings of it. Pope Paul IV., objecting to some of the nude figures in Michelangelo's "Last Judgment," which the painter did not alter, threatened to whitewash the wall—a catastrophe which Daniele prevented by painting some draperies over the offensive figures, whence he was nicknamed "Braghettone." He died at Rome in 1566.

**VOLTI**, in music, a term from the Italian, signifying that the leaf is to be turned over. V.S. means *volti subito*, turn quickly.

**VOLUME**. This word, as meaning a part of a book, is derived from the old form of a book, a roll (of parchment—Lat. *volumen*, from *volvo*, I roll). But our language takes from the French a sense of which the Latin knows nothing; and *volume* means bulk, size, or solid content. Thus the volume of a sphere is two-thirds of that of its circumscribed cylinder; the volume of a cone is one-third of that of a cylinder of the same base and altitude, and so on.

**VOLUNTARY**, in music, an extempore performance on the organ, intended as a variation or embellishment, during divine service, or more generally at its conclusion. It was originally so called because its performance, or non-

performance, was at the will of the organist. Sometimes the voluntary consists of a written or printed composition, which generally exhibits great freedom of style and manner. The change, order, and number of its movements have never been settled by any law deduced from the authority of particular example or general usage; consequently much is left to the fancy, taste, and judgment of the composer; and if, in the aggregate, he preserves a sufficient degree of dignity, seriousness, and science, not admitting any lighter ideas or passages than are calculated to relieve the more solemn, he may be said to keep within the pale and sacred use for which the organ is so truly fitted and designed. Or, of course, the organist may use any short appropriate composition or selection from other works, instead of a piece especially composed as a voluntary.

**VOLUNTEERS.** After Great Britain's declaration of war against France in 1803, Napoleon assembled a strong force at Boulogne, which he called the "Army of England." Circumstances prevented this force from even attempting to cross the Channel, but the threatened invasion caused a war panic in this country, and in a few weeks 300,000 Volunteers were enrolled and armed, most of them at their own expense, and held themselves in readiness to proceed to any part of the United Kingdom at which their services might be required.

At the conclusion of the war the force was gradually broken up, and nothing more appears to have been thought of the matter till 1859, when some talk of the possibility of another French invasion aroused the nation to a sense of its insecurity. General Peel issued a War Office circular sanctioning the formation of Volunteer corps, and they rapidly sprang up all over the country, so that in the following year upwards of 150,000 men were enrolled, although they received no pecuniary assistance whatever from the public funds. At first the government did not give much encouragement to the movement; but when they saw the turn which affairs had taken, they wisely assisted it by combining the companies into battalions, appointing paid adjutants and drill instructors, and a staff of inspectors, whose duty it was to visit the different corps and battalions, and keep them as efficient as possible. Acts of Parliament were also passed for the regulation of the force, and in 1863 what is known as the Volunteer Act (26 & 27 Vict., cap. 65), which embodied and amended all previous statutes, and under which the force is now regulated, received the royal assent.

1. *Organization.*—The force now comprises the following arms: Light Horse, Artillery, Engineers, Mounted Rifles, Rifles, Medical Staff corps. They are directly under the command of the officer commanding-in-chief, and the general officers commanding the various regimental districts, but on all occasions are to be led by their own officers, and all Regular officers appointed to inspect or command them must be senior to every Volunteer officer under him.

2. *Precedence.*—The different arms of the Volunteer force take precedence of each other in the order in which they are mentioned above, and the whole force ranks immediately after the Yeomanry. Officers of the Volunteer force take precedence with Regular and Militia officers as the youngest of their respective ranks, and with officers of the Yeomanry according to their rank and date of commission. All the officers of the Volunteer force take precedence among themselves solely according to their rank and date of commission.

3. *The drill and discipline of a corps* are put under the charge of an officer of the regular forces, who is attached to the Volunteer corps for a term of five years, and receives pay of about 10s. per day. These adjutants are under the command of the colonel, and rank regimentally either as captain or as senior of all of their own rank. Under the supervision of the adjutant are placed sergeant-instructors, who are detailed from the regular forces in proportion to

the number of companies in the corps which they are to instruct. Recruits are placed under them, and are not dismissed to their respective companies till they have been thoroughly grounded in elementary drill; after this stage much of their instruction is imparted by the adjutant or by their own company officers.

4. *Officers.*—Gentlemen desirous of receiving a commission in a corps must be recommended by the lord-lieutenant of their county, or by the colonel of the corps, to the Secretary of State, who submits their names to her Majesty. They must be not less than seventeen years of age, and must produce a certificate of health and of good moral character. On receiving their commission they must take the oath of allegiance, and subsequently pass both written and practical examinations in the drills of their corps. After passing, the letter *p.* or *p.s.* is prefixed to their names, according as they have prepared for examination with their own corps, or in one of the schools of instruction which have been established for the purpose at Aldershot, Woolwich, Chatham, Glasgow, London, or York. They usually receive a commission as second lieutenant, after which they may rise (usually by seniority) successively to the rank of lieutenant, captain, major, and lieutenant-colonel.

5. *Non-Commissioned officers and men* of a corps must be subjects of her Majesty, and between the ages of seventeen and fifty. In Artillery corps they must be not less than 5 feet 6 inches in their stockings, and 32 inches round the chest. In other corps they must have the same chest measurement, but may be only 5 feet 3 inches in height. On joining a corps they must sign an enrolment form and take the oath of allegiance. They must attend a fixed number of drills each year, must salute all officers in uniform, may not attend political meetings in uniform, and may not wear their uniform out of the country. In the case of actual or apprehended invasion they may be called out for military service, and are then liable to serve in any part of Great Britain, but they may not be ordered out of the country, and on no occasion can the civil power call upon Volunteers, as such, to assist in suppressing riots or disturbances.

The state of efficiency of each corps is ascertained partly from returns, which must be sent in annually by the commanding officer, and partly by an inspection, which a regular officer detailed for this duty makes annually at a full-dress parade of the corps. A very small proportion (about 3 per cent.) fail to comply with the requirements as regards efficiency, many officers have passed examination in tactics, and almost every corps contains detachments of men who have passed in signalling or in ambulance duties.

Every corps is supplied gratuitously with arms, and to a certain extent with ammunition and stores, but they must purchase their clothing and accoutrements, and provide drill halls and parade grounds. To enable them to do this they are allowed an annual sum per head, called a capitation grant, which they have to earn by fulfilling certain conditions as regards attending drill and acquiring skill in the use of the rifle. Up till 1887 this sum was notoriously insufficient to meet the necessary expenditure, and, in spite of heavy calls on the private purses of the officers, many corps got deeply into debt. In that year, however, public attention was loudly called to this state of affairs, and the capitation grant was increased from 30s. to 35s.; while, at the same time, the conditions for earning it in Rifle corps were made more stringent. The members who earn this grant are termed *efficient*, while those who pass an officer's or sergeant's examination are termed *proficient*, and the corps receives an additional grant of 50s. each.

The army estimates for 1887–88 provide for 3 corps of Light Horse; 60 Artillery corps; 17 Engineer corps, including the Railway Staff corps and the Submarine

Miners; 1 Mounted Rifle corps (Roxburgh); 212 Rifle corps; and 1 Medical Staff corps. The Light Horse corps are in Fifehire, Forfarshire, and Lincolnshire. The strongest Artillery corps are the 1st Glamorgan and the 1st Lanark, with an establishment of 1360 enrolled members each, followed by the 1st City of London with 1280. The strongest Engineer corps is the 1st Newcastle with 1363, followed by the 1st Gloucester with 1026, and the 2nd West York with 1000. The strongest Rifle corps is the 1st Edinburgh with 2500, followed by the 2nd Glamorgan with 2200, and the 1st Lanark with 1600; but many other corps are over 1000 strong. It is estimated by General Hauley that in the event of a foreign invasion of this country the Volunteers would form two-thirds of the entire force which we could assemble for home defence.

## TOTAL ESTABLISHMENT IN 1887-88.

Light Horse, . . . . .	425
Artillery, . . . . .	45,721
Engineers, . . . . .	12,776
Mounted Rifles, . . . . .	61
Rifles, . . . . .	196,129
Medical Staff corps, . . . . .	811
	<hr/>
	255,923

The capitation grant for above force is put at £129,000, and the miscellaneous charges at £70,700. Adding the charge for adjutants, £71,000, and for sergeant-instructors, £81,500, and the charges for provisions, clothing, transport and stores, £180,700, the total cost to the public is £535,900—by no means an excessive charge for what they get in exchange. Not a penny of this sum goes into the pockets of the Volunteers, and indeed almost every member of the force is put to some further private expense in the ordinary discharge of his duty.

The navy estimates for 1887-88 provide for 1512 Royal Naval Artillery Volunteers—65 officers and 1477 men—who are thus distributed: London, 431; Liverpool, 481; Bristol, 558; Clyde, 72. The capitation allowance for efficient volunteers is the same as in the army, and the total cost (including the pay of instructors) is about £6000 per annum. See NAVY.

**VOLU TIDÆ** is a family of molluscs belonging to the order GASTEROPODA, and nearly allied to the Cowries (Cypridæ) and Cones (Conidæ). Many of the species have large shells, remarkable for the great beauty of their colouring and elegance of form, owing to which they have been greatly prized by collectors. The shells of some species of Voluta are valued at £30 and £40. The Volutidæ are all marine, and are chiefly found in tropical seas; the fossil species date from the Cretaceous formation, and are found also in Britain and Europe. The animal has a large mantle, often lobed and reflected over the shell; the foot is very large, and partly hides the shell; the siphon is short and recurved. The shell is spiral, turreted, or convolute, with the aperture notched in front for the reception of the siphon; the columella is regularly and deeply plaited; and the operculum is generally absent. The principal genera are Voluta, Cymba, and Marginella.

**VOLVOX** is a genus of minute organisms now generally classed among the simplest algal plants, though some regard it as an animal belonging to the flagellate Protozoa. The best known species is *Volvox globator*, which is found swimming freely in ponds, generally in exposed situations. It is a hollow transparent sphere, just visible to the naked eye. It is a colony (cœnobium) of cells forming a single peripheral layer. Each cell is very similar to a Protozoon (or Chlamydococcus), and is a simple protoplasmic body, containing a green colouring matter, a red spot, a contractile vacuole, and two cilia, which project beyond the surface of the colony, and cause

the whole sphere to revolve. The cell-walls are very thick and gelatinous, projecting into the cavity of the sphere, and traversed by fine threads of protoplasm, which connect the cells together as a continuous network. Within the cavity are a varying number of similar smaller spheres, the daughter-colonies, formed by the repeated division of some of the cells of the parent-colony. The daughter-colonies finally escape by the bursting of the parent-colony. In addition to this process of vegetative reproduction, sexual cells are formed in the autumn. The male cells or antheridia consist of enlarged cells, which break up into numerous spindle-shaped bodies, the antherozoids. These swim freely in the cavity of the colony by means of two cilia, and fuse with the female cells, the oogonia, which are large flask-shaped cells, projecting into the cavity of the colony. As a result of fertilization a spherical oospore is formed with a thick cell-wall, which after a period of rest develops into a new colony.

**VON'DEL, JOOST VAN DEN**, the national poet of Holland, was born 17th November, 1587, at Cologne, whither his parents had retired from Antwerp, in order to avoid the persecution to which they were exposed from the religious severity and jealousy of the Austrian-Spanish government. As soon, however, as the republic of the United Provinces was established, the family removed to Amsterdam. The education he received from his parents did not extend beyond the ordinary acquirement of reading and writing; for his father was only a tradesman, and he himself afterwards dealt in hosiery. It was not until he had reached about twenty-six years of age that he began to study Latin. Among the more celebrated of his dramatic poems are his "Palamedes," "Gijsbrecht von Ainstel," and "Lucifer." The first of these, which was a direct allusion to the fate of the grand-pensionary Barneveldt, was not published till 1625. It was prosecuted by those in power as treasonable, and Vondel was sentenced to a fine of 300 guildens. The great interest of Vondel's work, however, for Englishmen is in the "Lucifer," for it may be considered the precursor of our "Paradise Lost," which it anticipated by fourteen years. The attempt to make Milton a plagiarist is of course absurd, but it is now abundantly shown that he used Vondel largely. The best book on this interesting subject is "Milton and Vondel," by George Edmundson (London, 1885).

Late in life, Vondel's circumstances grew worse, and his embarrassments were afterwards so much increased by the conduct of a spendthrift son, that at the age of seventy-two he was glad to obtain a situation with a small salary in a bank at Amsterdam. Even there, however, neither his energy nor his genius deserted him, for it was at this period that he composed, besides several other works, his "Jephtha," one of the best of his tragedies. At length, in 1668, he was permitted to retire, retaining his salary as a pension for life. He died on the 5th February, 1679.

**VORTICEL'LA.** See BELL-ANIMALCULE and INFUSORIA.

**VOR TIGERN**, the "king" or ruler of Southern Britain after the departure of the Romans (410), who, in his despair at the combined onslaught of the Picts and Scots from Caledonia and the English pirates by sea, adopted the desperate remedy of hiring a Jutish tribe of the latter under the leadership of Hengest and Horsa as mercenaries to oppose the former, giving them quarters in the Isle of Thanet (449). Almost immediately these mercenaries were joined by others, and kindred tribes also came over, so that in a few years Britain became their easy prey. It is said by the old British chroniclers that Vortigern was the more inclined to admit the Jutes to his kingdom by his passion for Rowena, the lovely daughter of Hengest, and that he actually became a heathen for her sake, and so married her. His subjects, say the British chroniclers, deposed him and set up his son Vortimer in his stead.



But Rowena contrived to poison Vortimer, Vortigern returned to the throne, and the fatal cession of Thanet took place. The English Chronicle, on the other hand, has no mention of Rowena save as a British tradition.

**VOSS, JOHANN HEINRICH**, an illustrious German scholar, was born on the 20th of February, 1751, at Sommersdorf, near Wahren in Mecklenburg. He received his early education in the little town of Penzlin, whence he was sent to the public school at Neu-Brandenburg; and in 1772 he went to Göttingen. In 1781 he published his German translation of the "Odyssey" in hexameter verse, which was received with the unanimous approbation of all competent judges. In 1793 he published his translation of the "Iliad" and the "Odyssey," the "Odyssey" being an improvement on the former editions. His German translation of the "Georgics" of Virgil had appeared in 1789. In 1797 he published his version of the "Eclogues," which, like the translation of the "Georgics," was accompanied with an excellent commentary. Two years later he published his translation of all the works of Virgil, but without a commentary. His numerous original poems were collected and published in 1802 in four vols. 8vo. He died in 1826.

**VOSIUS, GERARD**, a celebrated Dutch philologist, whose real family name was Voss, Latinized into Vossius, was born in 1577, near Heidelberg. He began his studies at Dordrecht, and after having acquired a considerable knowledge of Latin and Greek he went, in 1595, to the University of Leyden. In 1598 he took his degree in philosophy, and began to devote himself to the study of theology, ecclesiastical history, and Hebrew. In 1614 he accepted the rectorship of the theological college at Leyden. Some years afterwards he obtained the professorship of eloquence in the university. His publication, in 1618, of a history of the Pelagian controversy involved him in difficulties and brought on him a charge of heresy. Though he had refused two invitations to come to England, Archbishop Laud procured him a prebend in the church of Canterbury, and he came over in 1629 to be installed. He also received the degree of doctor of laws from the University of Oxford. In 1633 he removed to Amsterdam to hold the chair of history in the newly-established gymnasium, and died there in 1649. Vossius was a man of extraordinary learning, and had a powerful memory. His writings, most of which relate to classical antiquity, are very numerous, and some of them necessary to a student. They were collected at Amsterdam, 1695-1701, in six vols. folio.

**VOUSOIRS** (Fr. *route*, vault, arch) are the wedge-shaped stones forming an arch, the central one being called the *keystone*.

**VOW.** The Jews recognized three kinds of vows—of devotion, of abstinence, and of extermination or anathema. The Roman Catholic Church divides vows into *solemn* (taken in the presence of the church's ministers) and *simple* (or private).

**VOWELS** are the vocal elements of speech, the consonants being mere noises serving to divide and qualify the vowels. The manner in which the chief vowels are produced by the vibrations of the vocal cords, subjected to grave modifications through the varying shape of the oral cavity, is dealt with under **VOWEL-TONES**, as also is the logical order of the vowel-sounds. On this latter point see also **ALPHABET**. The difference between spoken and sung vowels is that in the former the pitch of the tone (i.e. the rapidity of vibration of the vocal cords) varies incessantly, whereas in the second it continues constant for at least a sufficient time to establish a musical tone. There are many more vowels used in speech and song than the orthodox five, *a, e, i, o, u* (or rather *i, e, a, o, u*).

Diphthongs are composed of two vowels run together, i.e. sounded by one effort instead of two, as *boy* (baw-ee).

The whole series of fourteen vowels and five diphthongs used in English is as follows:—

**VOWELS**.—1, *a* in *gnat*; 2, *ware*; 3, *fame*; 4, *father*; 5, *all*; 6, *want*.

7, *e* in *met*; 8, *ee* in *meet*.

9, *i* in *knit*.

10, *o* in *not*; 11, *note*.

12, *oo* or *u* in *fool*, *rude*; 13, *wood*, *put*.

14, *u* in *nut*.

**DIPHTHONGS**.—1, *i* (*ai*) in *high*; 2, *ay* (*ei*) in *say*.

3, *oi* in *boil*.

4, *ow* (*au*) in *how*.

5, *ew* (*iu*) in *meat*.

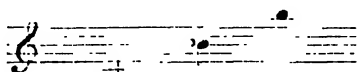
**VOWEL-TONES.** Every inclosed mass of air has certain proper musical tones with which it is in sympathy and which it will reinforce. This is the principle of all resonance boxes (as the body of a violin, an organ-pipe, &c.), and applies, in fact, not only to the prime tones concerned, but to a certain number of their upper partials. [As to these terms, see **ACOUSTICS**.] But sometimes the resonance chamber does not correspond with a given deep prime, but resonates one of its upper partials, exaggerating the force of this, and giving it a more or less human character of tone. The reason why the tone should be so like that of the voice is quite simple: it is just that the mouth and throat form between them a resonance chamber, and reinforce the tones produced by those membranous tongues which we call the *vocal chords*, altering the shape of this chamber so as to reinforce at will now one now another of the upper partials of the prime given out by the membranous tongues aforesaid. Therefore, while retaining unaltered the pitch of any note we may be singing, we can adjust the chamber formed by the mouth so as to add the vowel-characters *ah, eh, ee, oh, oo* to that tone, the effect being produced by the selection for resonance of certain of the upper partials of the singing note, and the neglect of the other partials which go to make up the whole compound tone, which we call a musical sound.

The human voice is very rich in partial tones, as might be supposed. As many as sixteen have been observed in a fine bass voice singing one of the brighter vowels. But in every case, by **RESONATORS**, the first six or eight partials are always clearly audible in the human voice; not, however, as with the purer instrumental tones, diminishing gradually in force as they ascend in pitch, but varying in an astonishing manner according to the vowel heard, the same partial sometimes screaming loudly into the ear through the resonator, sometimes scarcely audible, according to the movements of the mouth and change of the vowel.

It is important to find the chief proper tone of the resonance chamber of the mouth when tuned for the different vowels. This is done by trying in front of the mouth a large number of tuning-forks, and the more the sound of any fork is found to be reinforced the more nearly will that fork correspond with one of the proper tones of the inclosed mass of air. Helmholtz elaborately investigated this subject ("Sensations of Tone," second edition: English translation, 1885), and found that the pitch of strongest resonance of the cavity formed by the mouth and throat depends solely on the *roucel* sounded, and alters most remarkably for the slightest change of vowel, such as those, for instance, arising in different dialects of the same speech. But he found that the proper tones of any certain vowel were practically the same for all mouths alike, whether of men, women, or children, of young or old. For the want of space in those whose oral cavity is smaller is made up for by more nearly closing the aperture, which has the effect of deepening the tone. That this is true may be tested by any one with a tumbler, when by more or less covering the top of it, a resonance chamber varying from *c'* to *d''* or higher may be produced.



Taking the main vowels, A, E, I, O, U, pronounced in the Italian way, roughly represented by *ah, eh, ee, oh, oo*, Helmholtz arrives at the following results:—The vowels naturally divide themselves into two series, A, E, I, and A, O, U. The vowel A (*far*) is given by as nearly a funnel-shaped cavity as the mouth and throat can produce; this changes to O (*more*), and then to U (*poor*), by the opening of the mouth being more and more contracted, and by the cavity being enlarged, through the depression of the tongue, till in U it becomes like a bottle with no neck. Now, the pitch of such a chamber (a bottle with no neck) is the lower the larger its cavity and the narrower its mouth, and usually only one upper partial with strong resonance can be detected. We find these results (known from other experiments) borne out in the case in point; for the tone most reinforced when the mouth is set for U (*poor*) is *f*; but for O (*more*) it is *b $\gamma$ '*, and for A (*far*) it rises as high as *d'''*.



Vowel Tones: U (*poor*) O (*more*) A (*far*).

The second series of vowels is A, E, I. Here, from the funnel-shape of A (*far*), the mouth changes by the middle of the tongue rising towards the palate, and at the same time the root of the tongue being depressed, while the lips are drawn apart; the form of the cavity is now a bottle with a narrow neck. For I (*be*) the bottle is larger and the neck smaller than for E (*there*). In such chambers we always find two resonance tones, one for the neck, the other for the bottle. The higher tones continue the ascent of U, O, A, being for E *b $\gamma$ '''*, and for I *d'''*; but the lower tones, due to the back of the mouth, and rather difficult to fix, are for E *f'*, and for I *f*, the larger cavity giving of course the deeper tone.



Vowel Tones: A (*far*) E (*there*) I (*be*).

If this explanation be true, the singing a vowel against a large number of graduated tuning forks or strings, &c., ought to set them into vowel-vibration. Such is indeed the case; for let any one remove the action from an upright piano forte, leaving the strings bare, and loudly and slowly sing various vowels into the instrument (the words *far, there, be, go, too* would give nearly the vowels A, E, I, O, U), and he will be almost startled by the exactness of the echo. The vowel sung selects its sympathetic tone among the strings presented to it, and sets it strongly in vibration as compared with the other strings which respond to the merely musical part of the sound.

It is quite understood that the vowel effect is gained by the extra reinforcement of those partials of the sounding-note which are nearest in pitch the proper tones of the vowels in the above series. Absolute identity of pitch is of course rare to occur. It is also evident, from the sensitiveness of the cavity, that observers in different countries, and even in different parts of the same country, would obtain different results. Philologists look eagerly to this fact as a means of accurately defining pronunciation; but as yet no real advance in this direction has been gained.

**VOX HUMANA**, an organ stop, so called from its attempt to represent the human voice. It is composed of short capped reed-pipes, the "8-foot" pipe (its lowest note) being really only a little over 1 foot high. The result is that *on*, the upper partials of the primes are reinforced, and this, in a favourable specimen, coupled with the use of

a tremulant, and the whole stop being inclosed in a separate box in the swell organ, gives a very voice-like effect when not overforced. It is necessary to add that success is rare, and a good vox humana will make an organ famous.

On the American organ or reed organ the term signifies a "fan tremolo," that is, a piece of mechanism which causes a cardboard fan to rotate before the reeds, allowing the air to pass to them only by waves, and therefore giving a delicate wavy tremulous character to the tone, which is extremely effective in passages of expression.

**VULCAN** (Lat. *Vulcanus*, Gr. *Hēphaistos*), the god of fire. The name is connected by some writers with the Latin *fulgur*, lightning; by others, with the Sanskrit *ulka*, a meteor. The various myths in connection with Vulcan prove the great antiquity of his worship. Latterly the character, attributes, and history of the Greek Hēphaistos were transferred to the Latin fire-god Vulcan, and the two thus became identified. [See HEPHAISTOS.] Really Vulcan was by origin a masculine counterpart of Vesta, and his worship at Rome almost as important. Romulus built his temple with his own hands. All this has become obscure by the loss of the old Roman records and the confusion with Greek mythology.

The fire-mountain Vulcano, in the Lipari Islands, is named after Vulcan; and from this island all other fire-mountains have their name of *volcanoes*.

**VULCAN**. The eminent French astronomer, M. Leverrier, came to the conclusion that the apparent irregularities of Mercury's orbit could only be explained on the supposition that some unknown planet interposed between it and the sun. He was so assured of the correctness of his conclusion, that he submitted it to the French Academy of Science, by which learned body it was accepted as one of the established facts of philosophy. Meanwhile, an "obscure village doctor," M. Lescarbault, of Argères, who beguiled his scanty leisure with astronomical pursuits, was, as he believes, establishing what Leverrier's genius had laid down as a proposition. On the 26th of March, 1859, he observed what he believed to be a small planet crossing the disc of the sun. At first he thought himself deceived, but a second observation convinced him that he could not be mistaken. He accordingly made known his discovery to Leverrier, who hastened to Argères, cross-examined the doctor, and went through his calculations, which had been jotted down in pencil on scraps of paper. He satisfied himself that these calculations were correct, and on his return to Paris represented the village doctor's claims to the emperor, who bestowed upon him the order of the Legion of Honour. For many years the discovery was not confirmed, but during the eclipse of the sun, in 1878, Professors Watson of Michigan and Swift of Rochester, New York, both observed a planet which they believed to be Lescarbault's "Vulcan," and at the same time two other small intra-mercurial planets were discovered. But if Vulcan's orbit is at all near the plane of the earth's orbit, his transits should be frequent. Yet all our astronomers, constantly watching, have as yet failed to detect a case. "The existence of the planet is therefore as yet "not proven."

**VULCANISTS**, the followers of Hutton, who, towards the end of the last century, maintained the igneous origin of all crystalline and glassy rocks like granite, green-tone, and basalt. They were opposed to the NEPTUNISTS, led by Werner of Freiburg, who considered that these formations had been deposited in water.

**VULCANITE** or **EBONITE**, a very hard black substance made of a mixture of two parts of caoutchouc and one of sulphur, heated to 300° Fahr. for six hours. It is much used for making combs and other articles, and bears a high polish. For many purposes of ornament it replaces jet. Small quantities of magnesia and of oxide of lead are added to the sulphur and caoutchouc in making ebonite, the one giving hardness and the other fineness of grain.

**VULCANIZED INDIA-RUBBER** is caoutchouc exposed to the action of sulphur at a very high temperature, by which its valuable properties are greatly increased and some new ones bestowed upon it. See **INDIA-RUBBER**.

**VULGATE.** The Vulgate (Lat. *Vulgata Versio*, or Common Version) is the name sometimes given by St. Jerome to what he elsewhere calls the *Vetus*, or Ancient Version, and what Augustine calls the *Vetus Itala*, or Old Italian Version, being the most generally received of those early Latin translations of the Scriptures distinguished by biblical critics as the ante-Hieronymian, all of which are now lost, with the exception of some parts of this *Vetus Itala*, and such fragments of the others as are quoted in the writings of the fathers. Jerome's first labours as a translator of the Scriptures consisted in a revision and correction of this original Vulgate, which he completed about 390. Before this date, however, he had commenced an entirely new translation from the original Greek and Hebrew; and it is this to which the name of the Vulgate is now given. The earlier Vulgate, as revised by Jerome, has perished, except the Book of Psalms and the Book of Job, and the apocryphal books of Maccabees, Baruch, Ecclesiasticus, and Wisdom. Since the seventh century, when it was sanctioned by Pope Gregory I., Jerome's new version has been exclusively adopted by the Roman Catholic Church. The Council of Trent, in the sixteenth century, even conferred upon it an authority superior to that of the original text, by ordaining that the Vulgate alone should be esteemed authentic in the public reading of the Scriptures, in disputations, in teaching, and in expounding, and that no one should dare to reject it under any pretext whatever. Accordingly, all the Roman Catholic translations of the Bible into the modern languages profess to have been made from the Vulgate.

After the invention of printing the Latin Bible was the first considerable work that was sent to the press, but the earliest editions exhibited a very corrupt text. The first critical editions were those produced at Paris by Robert Stephens (Etienne) in 1528, 1532, 1534, 1540, 1545, and 1546. Of these the edition of 1510 is accounted the best.

The first revised edition of the Vulgate promulgated by authority in the Roman Catholic Church was issued at Rome from the press of the Vatican, in three volumes, folio, in 1590, under the title of "*Biblia Sacra Latina, Vulgate editionis, jussu Sixti V. recognita et edita*." This edition, the preparation of which had been begun under Pius IV., is known as the Sixtine Vulgate, or the Bible of Sixtus V., from its having been declared by that pope to be the authentic text; yet it had no sooner been published than it was discovered to be full of misprints and other errors. These were insufficiently corrected by the necessary emendations, printed upon separate strips of paper, being here and there stuck over the original word where the passage had been most grossly disfigured; and ultimately Gregory XIV., who succeeded Sixtus V., ordered it to be suppressed. A new edition, in the same form, was brought out in 1592, under the authority of Gregory's successor, Clement VIII., and this is called the Clementine Vulgate, or more frequently by Roman Catholic writers the corrected Bible of Sixtus V. It is now the authorized edition in the Roman Catholic Church; the Vulgate as since printed being commonly entitled "*Biblia Sacra Latina, Vulgate editionis Sixti V. et Clementis VIII.*" Protestant controversialists have, naturally enough, taken advantage of the variations to be found between the Sixtine and Clementine Vulgates, each published and declared to be the only true edition by an authority professing to be infallible. See also **BIBLE** and **VERSION**.

**VULPIC ACID**, an acid obtained from the lichen known as *Cetraria vulpina*, a lichen growing in Norway, and used there with nux vomica as a poison for wolves.

It crystallizes in yellow needles, insoluble in water,

slightly soluble in alcohol and ether, but very soluble in chloroform. It melts at 100° C. (212° Fahr.) The formula is  $C_{10}H_{14}O_5$ . It forms crystalline salts with the alkalies, called vulpates, having the general formula  $C_{10}H_{13}MO_5$ .

**VULTURE** (Vulturidæ) is a family of birds of prey (ACCIPITRES). In the vultures the bill is considerably more elongated than in the other families of predaceous birds, and often comparatively slender in its form; its basal portion is always straight, and the tip rather suddenly hooked. The lateral margins of the upper mandible are often sinuated, but never toothed. The head is usually



Head of the Tawny Vulture (*Gyps fulvus*).

naked, and the neck also frequently partakes of this character; in many cases the head is furnished with peculiar wattles, and the skin, both of this part and the neck, is sometimes adorned with brilliant colours. The eyes are placed on the sides of the head, without any projecting eyebrows above them. The wings are very long and pointed. The feet are covered with reticulated scales, and are formed for walking, not for prehension. The middle toe is very long, the hinder one rather elevated, and the whole are armed with stout but rather blunt claws.

These birds hardly deserve the title of birds of prey, for they seldom attack any living animal, and feed chiefly on carrion. It has been matter of dispute whether they are directed to their food by the sense of sight or of smell. There can, however, be little doubt that both the senses are made to contribute to the discovery of the carcase. Their lofty flight and telescopic eye are well adapted to detect any dying or dead animal, and as the action of one vulture may be, and in all probability is, watched by another, a sort of telegraphic communication as to the position of the object is kept up. Some travellers indeed assert that it is by sight alone that these birds discover their prey, as dead animals remain untouched if covered over, even when in an advanced stage of decomposition. The vultures are the great scavengers of nature in hot climates, where putrefaction is most rapid and most injurious to health. No sooner is an animal dead than its carcase is surrounded by numbers of these birds, who suddenly appear, coming from all quarters, in situations where not one had been seen just before. From the filthiness of their food the vultures emit from the skin and feathers a fetid odour. They gorge themselves to repletion and become partially torpid. They do not carry food to their young in their claws, but feed them by throwing up the contents of their crop.

The vultures are all inhabitants of warm countries, and are found both in the Old and New Worlds. The American vultures form a subfamily (Sarcoramphinæ), distinguished by their perforated nostrils and by the absence of an after-shaft to the feathers.

The Black or Arabian Vulture (*Vultur monachus*) is a

native of Southern Europe, where it is found especially in mountainous districts, and of Northern Africa, Persia, India, extending as far as China. The black vulture is a large species, measuring about  $3\frac{1}{2}$  feet in length. The general colour of its plumage is blackish-brown. The nest of this bird is built upon trees or rocks, and contains one egg, of a richly mottled red colour. The Tawny or GRIFFON VULTURE (*Gyps fulvus*) is another European species, and has been once taken in the British Isles, off Cork harbour. Several allied species occur in India and Africa. The Eared Vulture (*Otomyops auricularis*) is so called from the skin of the neck being curiously folded about the aperture of the ear. It is the largest of the Old World vultures, and is widely distributed in Africa, being common in the southern portion of that continent, and occurring also in Egypt, Abyssinia, and Nubia. It inhabits mountainous districts and breeds in fissures of the rocks. A closely allied species, *Otomyops calurus*, is found in India. The EGYPTIAN VULTURE (*Neophron percnopterus*) is a small widely distributed species, which has strayed several times to England. An allied species occurs also in India.

The largest of the American vultures is the CONDOR

(*Sarcorampus gryphus*) of the Andes of South America. The King Vulture (*Cathartes* or *Sarcorampus papa*) is an inhabitant of Central and South America, extending from Mexico to the borders of Paraguay, and found occasionally in Florida. It is rarer than the condor, and frequents the plains and forests instead of the mountainous districts, where the former species abounds. It is the only species of vulture with any pretensions to beauty. The plumage is a delicate fawn colour above and white below; the quills of the wings and tail are black. The naked skin of the neck is bright red above, passing into orange and yellow below; an ashy-gray frill surrounds the base of the neck. The face is blackish-violet, with a scarlet ring round the eyes. It feeds chiefly on carrion, like the other species, but also on snakes and lizards. The smaller vultures of the same region are said to pay this species such respect that they will not venture to commence their repast until the "king" has satisfied his appetite. The king vulture builds its nest in trees. The TURKEY BUZZARD or Turkey Vulture (*Rhinogryphus* or *Cathartes aura*) is spread through South America, extending to the Southern United States. One or two nearly allied species are also known.

## W

**W**, the labial sonant spirant (and in the form of *hw* the labial surd spirant), regarded as a consonant, really performs the double office of a consonant and a vowel, the natural order of the vowels being *i, e, a, o, u*. The sounds of *i* (that is, *ei*) and of *u* (that is, *oo*) are the most remote, and the attempt to pass with rapidity from either of these to the others, more particularly to the other extreme, gives an initial breathing which has the character of a consonant, in the one case *ei-oo*, or *yoo*; in the other, *oo-ei*, or *we*. Accordingly the letters *y* and *w* appear as the representatives, sometimes of a consonant, sometimes of a vowel. The English character *w* is formed by the repetition of a *v*, which itself is only a variety of the symbol *u*. In Latin the *v* or *u* consonants had probably the power of a *w*, a supposition which accounts for the use of a common character for the vowel and consonant. The Greek and Hebrew alphabets had also a single symbol for this consonant, which occupied the sixth place, and is called *digamma* in the former, *em* or *waf* in the latter. But in the Greek alphabet the letter went out of use, and is therefore commonly omitted in our grammars of that language, although the gap at this point in the Greek alphabetical designation of numbers still bears evidence to the original position of the letter. Most of the modern languages of Europe are deficient in a symbol for this letter. The French employ the diphthong *ou* prefixed to a vowel, as in the common particle *ouï*; the Spaniards prefer *hu*, as in *huero*, *huera*, &c. At other times the Spaniards have employed the letters *gu*, as may be seen in the different rivers of Spain Proper, which have prefixed the Arabic word *guad*, denoting water. The ancient Greeks often prefixed a simple *o* to represent a *w*, as in *oida*, &c. The use of *w* as a vowel, so far as our own language is concerned, is confined to the end of syllables, where it stands for a final *u*; and there is always another vowel prefixed to it, as in *new*, *law*, *hour*, but in the Welsh language it is employed by itself, and in the middle of syllables with the power of a vowel, the sound being akin to our short *u*. The map of Wales will furnish abundant examples, as *Pwlheli*, *Cwmtydr*, *Bettws*, *Lluchwr* (often written *Loughor*), &c.

Many nations have a difficulty in pronouncing the consonantal *w*; the Germans especially are not able to appreciate the difference between a *w* and a *v*, almost always substituting the latter sound, or what nearly approaches to

it. London, too, is remarkable for the confusion of the sounds—though this confusion does not seem to arise from any inability to pronounce either a *w* or a *v*, each being substituted for the other with a most amusing perversity.

*W* has disappeared from *ooze* (*iros*), *lisp* (*velisp*), *four* (*fower*), *soul* (*sawul*), *tree* (*treow*), *sister* (*awister*, *Ger. Schwester*), *such* (*awile*), *enough* (*eneow*), and some few other words. On the other hand it has crept into *whole* (*hol*), and *whoop* (*hoop*, *Fr. houper*). *Hw*, the aspirate form, has now disappeared from southern England, though northwards, and universally in Scotland, it still flourishes. The spelling of words beginning in *hw* is, however, always reversed, *hwa*, *hwat*, *hwelp*, &c., becoming *who*, *what*, *whelp*, &c. The old Scottish spelling was *quha*, *quhat*, *quhelp*, &c.

**WACE** (variously spelt *Gace*, *Gasse*, and in several other ways) is now understood to have been the Christian name (a vernacular form of Eustace) of the Anglo-Norman poet of whom it was once supposed to have been the surname. Robert used to be generally, and without the least authority, prefixed to it as his Christian name. "Master Wace" is the appellation which he uniformly bestows upon himself. He was born about 1120, in the Island of Jersey, and after studying, probably at Paris, he settled at Caen, where he was long a *clerc lisant*, and composed his principal works. For these he was made by Henry II. a prebend of the cathedral church of Bayeux. Wace is said to have died in England in 1174. The first, in point of time, of Wace's more important works is the "Roman de Brut," a poem of 15,000 lines. It is mainly a versification of Geoffrey of Monmouth's "Historia Britonum," then recently published, and derives its title from the Trojan Brutus, the supposed colonizer of these islands. Wace's is the earliest extant Norman-French version of Geoffrey's work, and his own additions are perhaps taken from tradition. But the most important of Wace's works is "Le Roman de Rou," apparently finished in 1155, a poetical chronicle of the Normans from the settlement of Rollo (Rou) in France to the year 1106. It contains about 17,000 lines. In this work Wace shows himself something between the trouvère and the monkish chronicler, and in much of it he follows prose narrators, especially the "Gesta Willelmi," a Latin chronicle of the career of William the Conqueror, by his chaplain, William of Poitiers. For much else of it, how-

ever, he has drawn upon tradition and the narratives of aged contemporaries. He often visited historical localities to procure information for it. So minute and lively is his account of the invasion of England and the battle of Hasting that the Bayeux tapestry, it has been maintained, was taken from Wace's poem. The best edition is that of Pluquet (Rouen, 1827), and the best English translation is that of Edgar Taylor (London, 1837).

**WACK'E**, a term originally employed by the German miners to denote a clayey-sandy rock. The name is still sometimes applied to the gritty beds of the earlier formations; and the compound term, Greywacke, was long adopted by the older geologists to designate the lowermost fossiliferous primary strata.

**WAD** is an impure earthy variety of the hydrated oxide of manganese, and forms an important ore of that metal. It is of a black or dark-brown colour, generally very soft, and is often found associated with the other ores of manganese. Considerable quantities were formerly obtained at Upton Pyne, in Devonshire. The mineral is largely used for the generation of chlorine gas for bleaching purposes, and also in the manufacture of an important pigment, *umber*.

**WADA'I**, a kingdom of Central Africa, first explored successfully by the German traveller, Dr. Nachtigal, in 1874, lies within the thirteenth parallel of east longitude and the twenty-first and twenty-second of north latitude. The population is estimated at about 2,500,000. The ground rises from east to west, and attains an elevation of from 1000 to 1500 feet above the sea. The religion is Mohammedan, and the customs of the people resemble those of most uncivilized Mohammedan countries.

**WAD'HAM COLLEGE**, Oxford, was founded by Nicholas Wadham, of Merifield, in Somersetshire, in 1609, for a warden, fifteen fellows, fifteen scholars, two chaplains, and two clerks. There are now ten fellowships, eighteen scholarships, and some exhibitions.

The buildings of this college, the most uniform of any in the university, are comprised in an extensive quadrangle, about 130 feet square, of modern Gothic, entered through a gate under a tower. Three sides of this quadrangle contain chambers for the society and the warden's lodgings, and on the east are the hall and chapel. The library and chapel, extending eastward, form two sides of an inner or garden court. The chapel is particularly noticeable for its old stained glass, the work of Bernard van Ling in the year 1622, as is shown by the date on the great east window. The glass for this and other windows in the chapel was made in the precincts of the college.

The college was built upon the site of the ancient house of the Augustine Friars. The Royal Society had its origin in this college, and held its earliest sittings, from 1652 to 1659, in the great room over the gateway.

Sir Christopher Wren, Lord Westbury, Admiral Blake, Sydenham (translator of Plato), and Dr. Wilkins, founder of the Royal Society, are among the best-known Wadham men.

**WAD'HURST CLAY**, a series of shales and clayey beds, sometimes attaining a thickness of 100 feet, occurring near the top of the **WEALDEN FORMATION** in Sussex. It is so named from the locality in which it is typically developed, and yields the iron ore for which the Weald districts were once famous.

**WA'DI** (Arabic, a valley) is the prefix to many names in the East and in North Africa, and is applied to any depression of the surface, with or without water.

**WADSET**, in Scottish law, an obsolete method of conveying landed property, which has been superseded by the "bond" and "disposition in security;" that is, by a covenant for payment of the debt, and a conveyance of the land by way of security, with power to sell. The whole has much the practical effect of an English mortgage, ex-

cept that in England the debt constitutes personal, and in Scotland the real property, of the creditor.

**WAGE FUND.** See **WAGES**.

**WAGER OF BATTLE.** See **TRIAL BY BATTLE** and **APPEAL**.

**WAGER-POLICY** is a name given to a policy of insurance made by persons having no interest in the event about which they insure. Such insurances, formerly common, were found to be productive of many pernicious practices, and therefore the statute 19 Geo. II. c. 37, was passed, by which it was enacted that no assurance should be made on any ship belonging to his Majesty or any of his subjects, or on any goods, &c., laden on board, "without further proof of interest than the policy, or by way of gaming or wagering, or without benefit of salvage to the assurer; and that every such assurance shall be null and void to all intents and purposes." The same principle is now carried out in life insurance, and no person is allowed to insure the life of another unless he can show that he has a legitimate interest in so doing.

**WAGES**, the plural of the obsolete singular *wage*, denotes the pay or recompense given, according to custom, stipulation, or enactment of law, for any kind of work or service. This broad definition would include the remuneration of all kinds of public functionaries, from the prime minister downwards, and of the professional classes, as well as that of the vastly greater numbers engaged in agricultural, manufacturing, and commercial pursuits. The term wages is, however, limited to the pay of those whose labour is rather physical than mental. It is in this latter sense that the expression will be used in this article.

Wages, in England, were for hundreds of years regulated by law. The first statute was passed in 1351, when the plague had depopulated the country to such an extent as to cause a scarcity of labour and a consequent rise in its price. It is not clear to what extent the statute was effectual in restraining the rise of wages, but, whether or not, it was frequently renewed with such alterations as the change of circumstance required. Professor Thorold Rogers ("Six Centuries of Work and Wages," 1881) has carefully traced the effect of the law under which the wages of artisans and labourers were, for nearly five centuries, fixed by the magistrates at quarter sessions, and he states that "for two centuries it failed, for nearly three (1563 to 1824) it succeeded. The motive for this repression was never concealed. It was designed in order to increase and secure rents and profits at the cost of wages." Towards the close of the eighteenth century the discrepancy between wages and the price of food became so great that the allowance system was introduced, under which the difference between the authorized rate of wages and the actual cost of maintaining the labourers and their families was made up out of the poor-rate. "In 1811," we again quote Professor Rogers, "the quarter sessions assessment and the compulsory apprenticeship, enacted by the Act of Elizabeth [5 Eliz. c. 4] were abrogated," and the assessment of wages intrusted to the vestries. "The farmers therefore had only to meet together when wheat was 100s. a quarter, and meat by the carcase was 7½d. a pound (having been less than half the price twenty years before), and agree that they would pay their workmen a shilling a day, with the rider that the rest of the public should pay him another shilling, which they took care to assess, collect, and distribute at their discretion." The Acts against combination [see **TRADE SOCIETIES**] were repealed in 1824, but as far as agricultural labourers, at least, were concerned, the system of vestry assessments and poor-rate allowances remained in force until the new Poor Law of 1835. The labourer was then left in a worse plight than ever until the repeal of the Corn Laws, for his right to subsistence, except under hard conditions, was taken away, while the artificial scarcity of food was kept up.

The position of the artisan has no doubt been greatly improved by the long series of Factory Acts, beginning with that of 1833, under which the hours of labour for some persons have been limited, the employment of children carefully restricted, and a variety of other useful regulations put in operation. The tally or truck system, by which the employer paid his wages, in part at least, in goods from a shop belonging to himself, gave rise to much abuse by bad masters, and was bitterly hated by the men. It has more than once been the subject of legislation, and is now finally done away with. See TRUCK ACT.

Systematic and reliable statistics as to the rates of wages in different trades throughout the country can hardly be said to exist; but there is a general consensus of opinion among experts, such as Professor Leoni Levi, Mr. Giffen of the Board of Trade, Professor Thorold Rogers, and others, that in the last thirty years (1857 to 1887) the position of the working classes has greatly improved. Professor Leoni Levi ("Wages and Earnings of the Working Classes," 1885) gives it as his opinion that up to 1881, wages generally had risen from 25 to 30 per cent. At that time, however, wages had already begun to fall, and the tendency is still observable, although it is probable that, considering the extreme cheapness of bread and many of the other necessities and simpler luxuries of life, since that date the actual purchasing power of the wage-earning classes has not, as yet, been injuriously affected. As Professor Rogers has pointed out, wages follow a change in prices very slowly, so that a period of falling prices is usually one of prosperity for wage-earners.

It may be added that the wage-earning classes comprise 70 per cent. of the population of the United Kingdom, and their earnings, according to Professor Levi, amounted in 1882-83 to £521,600,000, or 41·10 per cent. of the national income, which is put at £1,274,000,000. It is a noticeable fact, made much of by Mr. Henry George and Socialist writers, that, while the gross amount paid in wages gradually increases, it represents a slowly but steadily decreasing proportion of the national income.

The subject of wages is no less interesting from the economic than from the historical point of view, while the formation of sound opinions upon the matter is even more important. Useful as it may be to know whether the wages of labour are increasing or decreasing at any given period, as compared with others, it must obviously be more useful still to arrive at a knowledge of the economic causes which tend to bring about such changes. No apology, then, is needed for turning to the consideration of the wages question in its economic aspect. A hasty review of the doctrines which have been put forward by leading English economists on this subject during the present century will suffice to show the mischief that may be wrought by erroneous teaching about a matter of such vital importance, not only to the wage-earning classes and their immediate employers, but, less directly, to the whole community. Much of the contempt into which economic doctrines have fallen in this country, especially among the working classes and their friends, is due to the persistence with which the earlier economists ranged themselves in opposition to the claims of labour.

The sort of ideas prevalent among those who claimed to speak with authority on economic questions in the earlier part of this century may be gathered from the article on Wages in *Ries' Cyclopædia*, published in London in 1819. The writer of that article carefully avoids expressing any views of his own, but with many an "it is said," or "it is thought," quotes the opinions of some more or less authoritative writers of the day. The following are the most striking:—"The success of agriculture, manufactures, and commerce, all depend upon the price of labour being low, even very low." A little further on it is asserted that it is "almost a general rule that the higher their (labourers')

wages are the less they carry home, and consequently the greater is the wretchedness of themselves and their families."

About the same time (1817) Ricardo put forward the "iron law of necessary wages," as it is styled by modern Socialist writers. Briefly stated, it is—that the general rate of wages always tends to reach a minimum, which Ricardo calls the natural or necessary rate of wages, meaning by it either the lowest rate of pay on which it is physically possible for the labouring population to maintain and renew itself, or at least the lowest on which it will consent to do so. It is supported by the argument that every increase of wages is invariably followed by an increase of population or by a flow of labour from other less well-paid industries, the result sooner or later being that the supply of labour outruns the demand for it, and wages are brought back to the "natural" rate by competition among the labourers. This must be admitted to be theoretically true under certain conditions, though fortunately they are rarely found in actual operation. A painful illustration of its working, however, is not far to seek. The melancholy condition of the common sempstresses of London, so graphically described by Mr. W. Besant in "The Children of Gibbon," under what he calls the "law of 11½d. a day," is a case in point. It moreover shows that the decline of wages will not in such a case stop at the bare amount on which the labourer can be maintained and the supply kept up. Even slow starvation appears to be preferred to the workhouse, and when one worker is "used up" there are, alas! plenty more to take her place, so that the supply is renewed from without.

This was supplemented by the famous wage-fund theory of J. S. Mill, which we give in his own words (the italics are our own):—"Wages depend on the proportion between the number of the labouring population and the capital or other funds devoted to the purchase of labour." "If wages are higher at one time or place than at another, if the subsistence and comfort of the class of hired labourers are more ample, it is *for no other reason* than because capital bears a greater proportion to population. It is not the absolute amount of accumulation or of production that is of importance to the labouring class, it is not the amount even of the funds destined for distribution among the labourers, it is the proportion between those funds and the numbers among whom they are shared. *The condition of the class can be bettered in no other way than by altering that proportion to their advantage, and every scheme for their benefit which does not proceed on this, as its foundation, is, for all permanent purposes, a delusion*" ("Principles of Political Economy," Book II. chap. xi.)

The following extract presents the doctrine in its barest form even more strikingly:—"There is supposed to be, at any given instant, a sum of wealth which is unconditionally devoted to the payment of wages of labour. This sum is not regarded as unalterable, for it is augmented by saving, and increases with the progress of wealth; but it is reasoned upon as at any given moment a predetermined amount. More than that amount, it is assumed, the wages-receiving class can not possibly divide among them; that amount, and no less, they cannot but obtain. So that the sum to be divided being fixed, the wages of each depend solely on the divisor, the number of participants" (*Fortnightly Review*, May, 1869).

Any detailed examination of this theory would be beyond the scope of the present article, and we can only refer the reader to Professor H. Sidgwick's "Principles of Political Economy," Book II, chap. viii., Professor Walker's "The Wages Question," chap. iv., and Cliffe Leslie's "Essays," where the doctrine is critically examined and the fallacies underlying it exposed. It should be observed, however, that the wage-fund theory was ultimately abandoned by Mill, but not by his leading disciples,

Cairnes and Fawcett, the latter of whom gave the weight of his authority to the further proposition, that "It is physically impossible that any permanent rise in wages should take place without corresponding diminution of profits."

The wage-fund theory was no doubt all the more readily accepted by the capitalists and the educated classes generally, because, as Professor Walker says, "it afforded a complete justification of the existing order of things respecting wages. If there was, in truth, a definite fund out of which wages were paid, if competition unerringly distributed the whole of that sum, and if no more could be paid to the wages class, as a whole, without impairing capital, diminishing employment, and thus in the end injuring the labourers themselves, then surely it was an easy task to answer the complaints or remonstrances of the working classes, and to demonstrate the futility of trades unions and strikes as a means of increasing wages."

The working-classes and their friends, however, declined to accept this doctrine of despair, and preferred to throw political economy overboard altogether, a result more or less disastrous to all concerned.

As space will not permit a detailed refutation of the wage-fund theory, we must content ourselves with stating the conclusions adverse to it at which Sidgwick, Walker, Thorold Rogers, and other leading economists of the modern school have arrived. In the first place, then, instead of wages being wholly paid out of capital, as the wage-fund theory assumes, they are really paid out of current production. To use Professor Sidgwick's words, "The employer purchases the result of a week's labour, which thereby becomes a part of his capital; and may be conceived—if we omit, for simplicity's sake, the medium of exchange—to give the labourer in return some of the finished products of his industry." This alone invalidates the theory, but a more serious error still is that it disregards all those elements which go to make up the efficiency of the labourer, for instead of every additional labourer being necessarily a claimant for a share in a predetermined amount of wages, he practically, by his industry, creates his own wages, and under certain circumstances will make a more than proportional increase in the gross produce of labour, and so tend to improve, rather than otherwise, the position of each of his fellows. Illustrations of this may, as Professor Walker shows, be readily found in the experience of any new country where population is scanty. Fresh workers with or without capital are, as a rule, eagerly welcomed by such communities. Without stopping to reason upon the matter "they know perfectly well," to quote Professor Walker, "that the product will increase as the producers increase, and that in their situation the product will increase faster than the producers; and, therefore, that each producer may have more, and not less, by reason of the arrival of immigrants."

The law of "diminishing returns," familiar to economists, shows that in agriculture and mining at least, a time must come sooner or later when the further application of capital and labour results in a less than proportional increase of production. In that case wages must fall. But they fall not because there is a greater number to divide among them a predetermined dividend, but because the annual yield per head is not increased proportionally to the increased application of labour and capital.

Perhaps the most mischievous feature of the wage-fund theory is its total disregard of all those elements which go to make up the efficiency of the labourer. The result of thus ignoring the necessary connection between the efficiency and the reward of labour is that, to a large extent, modern workmen are prone to act as if they were, in very truth, "wage-slaves," as the Socialists style them. Their work is, when possible, done in a sluggish, perfunctory, and careless way; and, in brief, shows many of the evil char-

acteristics of actual slave-labour; while, as a rule, their trade societies give little or no attention to this matter beyond maintaining a very modest standard of proficiency.

In conclusion, any great and permanent improvement in the position of the labouring classes seems to depend, putting aside the Malthusian doctrine of population, mainly upon two conditions—(1) an increase in the efficiency of labour, and (2) real freedom of contract.

It is only by an increase in the product of labour that the fund for a permanent increase of wages can be procured. It has been abundantly proved that the best paid labour is really the cheapest in the end, and although it does not follow that any increase in wages would be directly attended by a corresponding rise in its efficiency, yet there seems little doubt that the two are intimately related. The interesting book on "Work and Wages," by Mr. (now Lord) Brassey, published in 1872, besides furnishing many remarkable illustrations of the superior capacity of the Englishman for labour as compared with other races, more particularly on railway construction, adds significantly: "The superiority of the English workman was most conspicuous when they first commenced work in a country in which no railways had been previously constructed." Thus proving, as Professor Walker points out, "that strangers placed within the same industrial environment, and afforded opportunities of like technical education, tend steadily, and it may be rapidly, to advance towards the efficiency of the native labourer." In his interesting chapter on the "Nominal and Real Cost of Labour" ("The Wages Question," 1877), Professor Walker not only establishes the truth of the paradoxical statement that the best paid labour is on the whole the cheapest, but shows how in a variety of ways the efficiency of labour may be increased, and among other illustrations quotes from a report on some extensive drainage operations in Northumberland, that "whereas the English beginner earns an average of 4s. a week more than the Irish beginner, better food and about ten years' practice reduce the difference to 1s. 1d."

The second condition is not less important than the first. It is that the workman should be in a position to practically enjoy that boasted freedom of contract which in many cases is such a mockery now—in other words, the workman must have, in some measure at least, an alternative. The trades-union movement has shown that by combination the labourer is enabled to bargain on more equal terms with his employer. In what may be called a normal state of industry, that is, when times are fairly good, the workman in most trades probably receives as large a share of the product of his labour as the state of the national industry will permit. Everything that tends to increase the mobility of labour—i.e. the power of transferring it from one industry to another or from one district or country to another, as circumstances may require—will undoubtedly, other things being equal, enable the workman, either individually or collectively, to make better terms for himself, and secure a larger share in the gross product of labour and capital. The relation between population and wages is too wide a one to be entered upon here, and it does seem that if the above conditions could be fully secured the pressure of population would for a long time at least cease to be felt, and the higher standard of living attained by the working classes, combined with the spread of education, would, in all probability, bring into fuller play the prudential checks on too rapid increase, and gradually relieve society of the Malthusian bugbear.

**WAGNER, WILHELM RICHARD**, a celebrated musical composer, was born at Leipzig on 22nd May, 1813. His father was an actuary in the police, and was passionately fond of the theatre, frequently taking part in amateur dramatic performances. Several of his children, brothers and sisters of Richard, adopted the stage as a profes-



sion, among them being Albert (the eldest), for many years stage manager of the Berlin Opera and the father of the well-known dramatic singer Johanna Wagner. Richard's father died six months after the birth of the child, and his mother two years later married Ludwig Geyer, an actor of Dresden. The boy's earliest impressions were thus associated with the drama. Though his musical aptitude showed itself during his boyhood he was in no respect an infant prodigy. He was educated first at the Kreuzschule, Dresden. He notes that his books were marked "Richard Geyer," though Geyer had in fact died the year before his stepson entered the Kreuzschule (1822). In addition to the ordinary course of classical study he had lessons on the piano, which all his life he played very badly. His first attempt at musical composition was made in connection with poetry—a significant fact in the life of the future representative of the poetic idea in music. At the age of eleven he had written a stupendous tragedy—a "kind of compound of 'Hamlet' and 'King Lear'" he calls it. "The design," he adds, "was grand in the extreme. Forty-two persons died in the course of the piece, and lack of living characters compelled me to let most of them reappear as ghosts in the last act." Suddenly the idea struck him that so grand a work ought to have a befitting musical accompaniment, and immediately he set to work to supply that want, regardless of his very imperfect knowledge of the art. These wild attempts, continued through several years, eventually led to serious study. Wagner took Beethoven for his model, and the works of that master he studied with what one of his early friends calls a genuine *furore Teutonico*. Weber was another idol of his, all the more that he was not an unfrequent visitor at the house. He also during his university career (at Leipzig) went through a course of counterpoint under Cantor Weinlig, and his proficiency in that difficult branch of art was shown in the symphony written and performed at the Gewandhaus Concerts in 1832, and revised a few weeks before his death at Venice. In the meantime the *res angusta domi* compelled Wagner to turn his art to more practical account, and about 1834 he became conductor of the theatre of Magdeburg in Prussia, where a juvenile opera, the "Liebes-verbod," founded on Shakespeare's "Measure for Measure," was performed without success. It has totally disappeared, with the exception of a single melody, which was subsequently embodied in "Tannhäuser." To add to his discouragement at the failure of his work, the manager of the theatre became bankrupt, and his career in that direction was closed. He next tried at Leipzig to get a hearing for his opera. In 1837 he succeeded in obtaining the appointment of conductor at Königsberg, but he had hardly got his forces into trim when the director became bankrupt. The indefatigable man now became conductor at Riga, and here he began his first acknowledged opera, "Rienzi," which he destined for Paris. For that city he sailed in the same year without friends or introductions to open the way to the great theatres for the unknown foreigner, but trusting in his stars with that absolute confidence in his own resources which never left him through life. He stopped eight days in London during his journey. At Paris Meyerbeer did all he could for him, but failed. All his attempts at having his opera performed proved in vain, and Wagner was compelled to undergo the most miserable drudgery to gain the necessities of life for himself, his first wife—an actress whom he had married at Magdeburg—and an enormous Newfoundland dog, with whom, in spite of his poverty, he refused to part. During this time he finished "Rienzi" (in November, 1840) and the greater part of the "Flying Dutchman" (1841), the idea of which had come to him during his stormy voyage from Riga to London on his way to Paris. "Rienzi," all but repudiated by the composer in later life, was the first stepping-stone to his final triumphs. It was accepted by the Dresden theatre and performed in

1842 with signal success. What was of equal importance to Wagner was the possibility of now getting a hearing for the "Flying Dutchman," which the popularity of "Rienzi" gave him means to produce at the beginning of 1843. As a result the post of conductor of the Royal Opera, one of the most important and lucrative musical appointments in Germany, was offered to the composer, who was already at work on "Tannhäuser," which was produced on 19th October, 1845. In consequence of his taking part in the revolutionary movement of 1848 (in "Beust's Memoirs" it is asserted that a letter of Wagner's confesses to incendiarism on his part in the royal palace) Wagner was obliged to leave Dresden and go into exile. He was tried in his absence and condemned to death. He had taken refuge in Switzerland, selecting Zürich as his residence. Here he wrote "Lohengrin," which, through the efforts of his warm friend and admirer, Franz Liszt, was produced at Weimar, where Liszt was then conductor, on 28th August, 1850. It is in this work, the performance of which was a triumph for the composer, that Wagner's art theories may be said to be first fairly exemplified, though in his later music-dramas these theories are unquestionably pushed to a much further development.

During his enforced severance from the active life of the operatic stage, Wagner wrote his two most important theoretical works, "Opera and Drama," and "The Work of Art of the Future," the latter probably the origin of the nickname, "Music of the Future," applied to Wagner's music by one of his enemies, the late Professor Bischoff, and subsequently adopted by his friends as an omen of lasting fame. In addition to his theoretical works, Wagner conceived during the first years of his exile the plan of his greatest, or at least most colossal work, the tetralogy of the "Ring of the Nibelung," which occupied him for a quarter of a century. The drama in its present form was completed as early as 1852, and during the three following years Wagner wrote the music to the "Rheingold" and the "Valkyrie." In 1855 he accepted an invitation to come to London to conduct the concerts of the Philharmonic Society; but his method of directing an orchestra was so different from that of most other conductors that fierce opposition was aroused, and the engagement was not renewed for the following season. Before continuing the composition of the tetralogy Wagner now undertook a new work, "Tristan und Isolde," his masterpiece as far as unity of design and sustained passion are concerned. This great work, finished in 1859, and first performed in 1865 at Munich, was partly written at Venice, the city where many years later death awaited the master. In 1861 "Tannhäuser" was given at the Grand Opera, Paris, with disastrous results. It was simply hooted off the stage without being heard, in a most brutally cruel manner. The causes of this world-famed fiasco are said to have been partly political. Prince Metternich, the Austrian ambassador, had taken great interest in the matter, and induced the emperor to command the performance of the work—sufficient reason for the Legitimists of the Jockey Club to ruin the work *a priori*. Nothing daunted by this ill-success, Wagner returned to his solitude and his work. One good thing was gained by the hatred of the French, permission to return to Germany. Wagner now heard his own "Lohengrin" for the first time. The tetralogy made steady progress, and in 1867 a new opera, "Die Meistersinger von Nürnberg," was finished and performed in the next following year at Munich, both the Meistersinger and Tristan having been aided by the ardent enthusiasm of Hans von Bülow, who directed them. Wagner himself had been called to Munich in 1866 by the young and enthusiastic King Ludwig II. of Bavaria, who remained his friend and patron to the last.

This extraordinary episode of the devotion of the King of Bavaria is only to be fully realized by a perusal of



Wagner's letters to Frau Elise Wille, who for the period immediately preceding it had been Wagner's good genius. After the condemnation of his "Tannhäuser" at the Paris Opera House, when he was miserably poor and an object of ridicule to all but a few musical enthusiasts, living by precarious concerts and hack work for the publishers, she gave him hospitality and did all that she could to enable him to breast the tide which then rushed against him. The king in these letters appears more astonishingly strange than any one who has not read them could have supposed him, notwithstanding his well-known eccentricities and vagaries. And yet points in his character are brought out that interest and inspire sympathy.

Wagner writes of King Ludwig in rapturous terms. He has some ado to "prevent himself falling on his knees and adoring him." Elsewhere he says, "The admirable love of the king reconciles me to living longer. I live in him, and he lives in me. He keeps all others removed from me. I am only to dream and create. The 'Nibelungen' are finished and 'Parsifal' is begun. All this is fine. It is pure magic." This dream ended in Munich rising against Wagner, and in the king being forced to send him to Switzerland. Madame von Bülow (Cosima, daughter of Liszt) and her children consoled him there. She then divorced Herr von Bülow and married Wagner, who preferred settling with her at Baireuth when he returned to Bavaria in 1872, to being in the immediate vicinity of Ludwig II., who was ready to build him a theatre after his own plans at Munich. The king, however, continued to be his munificent patron, friend, and disciple, until the death of the maestro. It was, indeed, only this powerful assistance of King Ludwig which enabled Wagner to realize the boldest dream of his life, the performance of his "Ring of the Nibelung" at a theatre erected for the purpose at Baireuth. This event took place in the summer of 1876, before a representative audience, including the Emperor of Germany and leading artists from all countries of the civilized world. It marked the climax of Wagner's career, but by no means the end of his incessant labours. The town of Baireuth helped loyally towards the building of Wagner's theatre; and his friends poured forth energy and enthusiasm in the task of raising the £45,000 required. "Wagner societies" were instituted in all the capitals of Europe, each sending in its contributions, subscriptions, profits of concerts, and the like, till so much was obtained as enabled Wagner to build his theatre and hold his performances. A debt of £7500 remained, and it was with the hope of redeeming part of this that Wagner came to London to the so-called "Wagner festivals" of 1877. But the festival barely paid expenses; and it was only by means of some extra concerts that Wagner was able to send £700 to Baireuth. The large balance was gradually made up by the author's percentages upon the performance of his operas at Munich and elsewhere.

This famous Baireuth theatre is, in its way, as original a conception as the operas. The best idea of it is gained by imagining a huge wedge, the point of which touches the back of the stage, and the greater part of the sides of which are the sides of the auditorium. The latter consists of floor alone, rising steeply, so that each row of spectators has a good view of the stage; there are neither galleries nor boxes, and all seats face the stage. The orchestra is invisible, sunk beneath the level of the floor, and the trumpets thrust even under the stage itself. Thus a veil of orchestration still rises between the auditors and the singers, but the ordinary dress and constrained attitude of the orchestral performers and the beat of the conductor no longer stimulates a perpetual conflict between their everyday unbecomeliness and the pictures of colour, form, gesture, and tone which the stage affords. Everyone who has heard a performance at Baireuth is loud in praise of the beautiful effects resulting from this arrangement.

The performances at Baireuth, successful as they artistically were, proved so costly and laborious that the theatre remained closed for six years. It was then reopened for Wagner's last work, "Parsifal," a work much of which is so fervently religious in tone that its admirers listen in solemn silence as at a devotional office.

Wagner was sixty-five when he began to write "Parsifal" (he having read the completed poem to his friends in London a year before that), and its composition took him nearly four years. He finished it early in 1882 at Palermo, whither failing health had driven him. In the autumn of 1882 Wagner took up his residence at the Palazzo Vendramin Calergi, on the Grand Canal, Venice. His health grew worse, but no alarm was felt. He welcomed Liszt, his father-in-law, who arrived on a visit. Quite unexpectedly, and almost painlessly, he died, 13th February, 1883. He was buried by his own wish in the garden of his house at Baireuth, which he had named "Wahnfried."

The following is a list of Wagner's operas, with the dates of first performance and of production in England attached:—"Rienzi, der letzte der Tribunen"—first performed, under Wagner, 1842, Dresden (in England, 1879); "Der Fliegende Holländer"—first performed, under Wagner, 1843, Dresden (in England, 1870); "Tannhäuser"—first performed, under Wagner, 1845, Dresden (in England, 1876); "Lohengrin"—first performed, under Liszt, 1850, Weimar (in England, 1875); "Tristan und Isolde"—first performed, under Bülow, 1865, Munich (in England, 1882, under Richter); "Die Meistersinger von Nürnberg"—first performed, under Bülow, 1868, Munich (in England, 1882, under Richter); "Der Ring des Nibelungen, ein Bühnenfestspiel;" "Das Rheingold"—first performed, 1869, Munich; "Die Walküre" first performed, 1869, Munich; "Siegfried," "Götterdämmerung," and the entire work, first performed under Hans Richter, at Bayreuth, 1876 (in England, 1882, under Seydel); "Parsifal, ein Bühnenweihfestspiel"—first performed at Bayreuth, 1883, under Levi. Wagner's literary works, collected in nine volumes, have been published in Leipzig, 1871. "Die Kunst und die Revolution," "Das Kunstwerk der Zukunft," "Oper und Drama," and "Beethoven" are the titles of his most important treatises. In the last-named the philosophy of Schopenhauer is discussed, in as far as it bears upon the æsthetic basis of music.

That the work of Wagner will have a lasting effect on the art of the present and of the future, that he was indeed a great power—all this is acknowledged by those most hostile to the movement inaugurated by him. It may, indeed, be doubted whether a similar combination of gifts has ever been witnessed in the same individual. If it is remembered that the same man whose music has revolutionized the world of art was also the author of dramas considered by some as literary efforts of the highest order, and that he designed and superintended the rendering of those dramas down to the minutest details of scene painting and scene shifting, one may well be astonished at those various tasks. He believed himself charged with a mission, and that mission is fulfilled. Whether dramatic music is a better or a worse thing for what he has made it, certain it is that it can never again be what it was before him, any more than a river can flow back to its source. As to the nature of the reform initiated by him, there can be little doubt. The composer himself has elucidated the point in many theoretical writings. It is, however, an entire mistake to think that Wagner wrote his operas according to, and in illustration of, a preconceived scheme. His most important theoretical work, "Oper und Drama," was written about 1850. It was already ten years since his practical reform of the opera had begun with the "Flying Dutchman," and it was further developed in "Tannhäuser" (1845) and "Lohengrin" (1849). It was

from these works, spontaneously conceived, as well as from those of other composers, that Wagner deduced his theory, and not *vice versa*. The "Flying Dutchman," so far from being the outgrowth of a doctrine, is perhaps the most subjective work in dramatic literature. It was written in the darkest period of Wagner's career, when in Paris, homeless and friendless, he was nearly brought to the verge of starvation. To express his mood in these circumstances the conventional pomp of the grand opera which he had introduced in "Rienzi" no longer sufficed him, and he had recourse to the pure mythical type of the weary mariner tossed by the waves of the ocean, homeless and friendless like himself; for with Wagner poetry and music were always one, the latter flowing from the former with organic necessity. This is what he himself says on the point:—"The nature of the subject could not induce me, in sketching my scenes, to consider in advance their adaptability to any particular musical form, the kind of musical treatment being in each case necessitated by these scenes themselves. I never thought of contemplating, on principle and as a deliberate reformer, the destruction of the aria, duet, and other operatic forms, but the dropping of these forms followed consistently from the nature of my subjects."

Wagner is now generally admitted, even by those who do not care for his music, to be the greatest master of the orchestra, though some connoisseurs still give that place to Berlioz. The charge of deficiency in melody which is so largely brought against him, is of course, absurd; but if the attack is upon his want of the tune-writing faculty, it would be more just. Yet there is so much that is delightful, and still more that is grand, in the works of this great man, that it is necessary to search out the reasons why during his life he was so much abused and derided, and why it was only at the last, even with the devoted support of a king, that he could gain the position which was his due.

The causes are two. First, Wagner was half-a-century in advance of his age, and even with his intensely powerful personality it took him more than a quarter of a century to get a good hearing. He therefore suffered the fate of all reformers. But secondly, he was by no means equal in nobility of character to nobility of genius. His writings are frequently so brutal in their invective, so coarse, so unblushingly arrogant and conceited, that those who love Wagner best would wish he had never written them. His remarks upon Mendelssohn, upon Schumann and Schubert, upon Berlioz, and above all upon Meyerbeer, who had been a good friend to him in days of bitter adversity, are such as a noble-minded man should never have penned. The insulting revenge he took upon all France for the shame of the Tannhäuser episode inflicted on him by an angry clique, the burlesque drama he wrote, ridiculing the torture of beleaguered Paris in 1870, is degrading to think of. His "Jews in Music" is abominable. His life was by no means the dignified martyrdom to principle he would make it to be; he could be time-serving to a patron at necessity. The contrast with the greatness of soul which ennobled Beethoven is very striking in this and other particulars. But much is to be pardoned to a truly great genius, and in spite of his many failings as a man, Wagner as a creative artist is truly great.

Wagner was neither a rapid nor regular worker, though he used to say that he was always composing. Most of his poems, even those of his latest operas, had been written when he was young, which accounts for the rough-hewing of the verses, and he was wont to recite passages of them to himself as he went out for his afternoon's walk.

In the mature works of Wagner, which he prefers to style *dramas* not operas, music is but one, though it is the pre-dominant element. The music is not subordinate, but goes with the dramatic development, and enlarges every step by intensifying the meaning of the action and the

poetry. The definite characterization of the personages of the plot in the music is not thrown into isolated sections of prominence, as arias, trios, &c. The basis of the vocal melody is not so much tune as just declamation; but it is, at the same time, such as admits of most powerful or just expression of the predominant emotion. In some cases the position of the voice, musically, is entirely subordinate, but there do not fail to be plentiful opportunities when the singer can show his art as well as his passion. Of the details of such a large subject it is not possible to speak here. Wagner's original method of orchestration and his extraordinary mastery of effect are of the greatest importance in art, and have exerted much influence upon younger composers. The controversies which have raged over his methods among musicians are not in the least likely to cease, and many men may long continue to dislike certain features in his work; but in the long run it will be impossible to deny either the greatness of his mastery or the nobility of his aims as an artist.

**WAG'RAM**, a village of Austria, 11 miles north-east of Vienna, on the left bank of the Kossbach. It is famous for the victory gained there by Napoleon I. over the Archduke Charles of Austria on 5th and 6th July, 1809.

**WAG'TAIL** (*Motacilla*) is a genus of passerine birds belonging to the family Motacillidae. The bill is long and slender; the wings are long and pointed, with the innermost secondaries exceeding the primaries in length; the feet are large, with rather long slightly-curved claws; and the tail is narrow and longer than the wings. The Pied Wagtail (*Motacilla lugubris*) is a common British species, and in the south of England is a permanent resident throughout the year. It is also common in the south of Europe, but further north, both on the Continent and in Britain, it is chiefly known as a migratory species. It is about 7 or 8 inches in length, and the plumage is beautifully variegated with black and white. The pied wagtail is usually found on the margins of rivers and ponds, and in damp meadows, where this graceful little bird may constantly be seen running about, or flying from one spot to another with a light, buoyant, undulated flight, and accompanying every movement with a singular perpendicular wagging of the tail, a habit common to all the species and from which their popular name is derived. The food of this species, as of all the other wagtails, consists principally of insects, which it finds in abundance in the damp places frequented by it, where also small molluscs and worms occur freely, and doubtless form a portion of its diet. They also capture insects on the wing, in the manner of the flycatchers, by flying up from the ground in pursuit of them as they pass along. The note is a sharp chirp. The nest of the pied wagtail is made up of root-fibres, withered grass, and moss; the lining consists of hair and a few feathers. A bank, a hole in some old wall, the thatch of a cart-shed or other farm-building, faggot-piles or woodstacks, and hayricks, are all localities where it is generally placed, and almost always near water. The eggs are five or six in number, grayish-white, spotted all over with gray and brown.

The White Wagtail (*Motacilla alba*), a very similar species, is the common wagtail of the continent of Europe, but is only an occasional visitor to this country. The Gray Wagtail (*Motacilla melanope*), abundant in Britain and Europe, is a migratory species, being a summer visitor to the northern counties, and a winter visitor to the southern counties of our island. It is bluish-gray above, yellowish beneath. The Yellow Field Wagtail (*Motacilla rayi*) belongs to a group of wagtails with shorter tails, the plumage gray and yellow, and habits less aquatic; hence they form for some a distinct genus, *Budytes*. The present species is a summer visitor to Britain, and frequents chiefly pastures and cornfields. The plumage is pale olive above, with the wings brown and the lower surface bright yellow.

**WA'HABEES, WAHABYS, or WAHABITES,** a Mohammedan sect, founded by a learned Arabian, Abd-el-Wahab, son of a petty Arab sheikh, born in the Arabian Nijd or Highlands, towards the end of the seventeenth century. He is said to have visited various Mohammedan schools in the principal cities of the East, and having observed with grief the many corruptions, both of doctrine and practice, which had accumulated about the primitive religion of Islam, to have formed the resolution of restoring the Mohammedan world to purity, and of extending the faith in non-Mohammedan countries by means of the sword. Central Arabia was at that time divided among a large number of independent chiefs, and one of these, Ibn Saoud, the ruler of the town and territory of Derayah, became Wahab's first convert and the military leader of the new sect about 1760, the example of Saoud being speedily followed by all his followers and kindred. The new prophet, like the founder of the faith, appealed to the Arabs by means of the double motives of religious zeal and promise of plunder, and his cause spread with wonderful rapidity. On the religious side he prohibited with stern severity the use of opium, wine, and tobacco, and the immoral practices in which many of the Mohammedans, especially the Turks, had indulged; condemned as idolatrous all reverence for the tomb or birthplace of Mohammed or any other saint, thus setting himself against an enormously powerful form of Eastern superstition; and declared that as Mohammed had preached for all nations and not for the Arabs alone, his doctrines were to be propagated by the sword, and all who would not adopt them were to be severely punished or put to death. On the secular side he is said to have promised Ibn Saoud, in return for his support and obedience, that he would make him the first ruler in Arabia, and to his followers were offered the spoils taken from those who refused obedience. Saoud was a man of courage and ability, and under his leadership the Wahabees extended their influence over all the surrounding tribes in the space of a few years, and when Saoud died, in 1765, his son Abd-el-Aziz pushed on the warfare with such restless vigour as to carry his arms to the utmost limits of Arabia. The Turkish authorities attempted in 1797 to check the progress of this new orthodox revival, but the expedition proved a failure, and in 1801 Ibn Saoud, the founder's grandson, led his warriors against the holy city of Kerbela, captured it and its treasures, massacred the majority of its inhabitants, and repulsed a Turkish expedition intended for its relief. Extending their ravages to Syria, Irak, and Mesopotamia, the Wahabees increased so much in power that in 1803 Mecca fell into their hands, and the following year Medina also fell before their victorious arms. Mecca surrendered at discretion, and its inhabitants were unmolested beyond being forced to refrain from fine dresses and to give up their pipes and tobacco, while they were compelled to follow strictly all the outward observances of the faith; but Medina was plundered of its accumulated treasures, and the pilgrimages were forbidden to all persons save Wahabees. The interference with the sacred pilgrimage caused consternation in the Mohammedan world, and Mehemet Ali, the pasha of Egypt, was charged by the sultan with the conduct of a new campaign against the Wahabees. Ibrahim Pasha, son of Mehemet Ali, retook Medina in 1812, and Mecca in the following year, and in 1814 the death of Saoud deprived the Wahabees of their able leader. His successor, Abdallah, exercised a less dominant influence, and internal dissensions facilitated the progress of foreign invasion. In 1818 Ibrahim penetrated as far as Derayah, which he captured and reduced to ruins. Abdallah and his principal counsellors were then despatched to Constantinople, where they were soon afterwards beleaguered. Meanwhile Ibrahim Pasha completed the subjugation of the Nijd, appointed a viceroy-governor over it, and returned to Egypt.

For a time it seemed as if the spirit of the Wahabees was utterly cowed, but the tyranny of their Egyptian rulers once more roused the dormant courage and enthusiasm of the people. They broke out into open rebellion; declared Turki, a son of Abdallah, their sultan; established the seat of their government at Riadh; and commenced a gallant and protracted struggle for independence. Eventually they recovered their supremacy in Central Arabia, and at the present day their influence extends over the greater part of the Arabian Highlands with the adjacent provinces, the number of towns and villages included in this territory being between 300 and 400, while the number of the population exceeds 1,200,000. According to Palgrave the number of fighting men in the ranks of the Wahabees is over 47,000.

In the earlier periods of their history the influence of the Wahabees extended to India, and in 1823 a number of Hindus and Pathans who had embraced the reformed faith established a colony at Sitana, on the north-west frontier, near Peshawar, under a leader named Syud Ahmed. They soon came into conflict with the Sikhs, and after a few successes they were, in 1831, utterly routed and their leader slain by one of the generals of Runjit Singh. Their fanaticism was proof, however, against this defeat, and their missionaries, who declared that their leader was not dead but had only disappeared for a time, gained many converts in North India. When the Punjab was annexed by Great Britain the Wahabees transferred their hatred from the Sikhs to the British, and their inroads over the frontier and the internal conspiracies that arose gave the government considerable trouble. In 1858 and 1863 regular expeditions were sent against them, and in the latter year some important state trials were held for the detection and punishment of the conspirators within British territory. In 1868 another expedition was sent against them, and again it was found that they had been assisted with arms and money by their friends in British India. A firmly sustained policy of repression, however, was successful in the stamping out of the home conspiracies, and at the present time the Mohammedans of India appear to be fairly content with British rule. See "Histoire des Wahabites" (Paris, 1810); Buechhardt's "Notes on the Bedouins and Wahabees" (London, 1830); Palgrave's "Central and Eastern Arabia" (fifth edition, London, 1869); and "Indian Mussulmans," by W. W. Hunter (London, 1872).

**WAIB'LINGEN.** See GHIFFELINE'S.

**WAINAMOI'NEN, EPIC OF,** another title by which we know the poem entitled "KALEVALA," which has recently been recorded in writing from the oral traditions that have existed for centuries among the Finns. Its theogony resembles the so-called Orphic in its general character.

**WAIN'SCOT,** in architecture, is the framed lining in panels with which a wall is faced.

**WAITS** (from watching or waking), the popular name for the itinerant musicians who play in the streets and villages of England during the Christmas holidays, and are rewarded by the contributions of the charitable. The practice is of great antiquity, a regular company of waits having been established at Exeter as early as 1400. As these old minstrels were always pipers, the name "wait" got to be applied to the native oboe or schalm, a small pipe with a reed in the mouthpiece.

**WAIVER** (Saxon *waþian*, to abandon or give up), a legal term, signifying that the plaintiff or defendant refuses to accept or to avail himself of something, as, for example, of some mistake or accidental irregularity which in strictness he might have converted to his advantage.

**WAKE** (Anglo-Saxon *wæc*), the English equivalent of the ecclesiastical *vigil*, was the name given to a holiday festival once universally celebrated in the country parishes

of England. Wakes originated at the period of the conversion of the Saxons to Christianity, and were established to commemorate the birthday of the saint to whom a particular church was dedicated, and the anniversary of the dedication. As the ecclesiastical day was reckoned from sunset to sunset, the festival began on the evening previous to the day itself, and during the night the people customarily performed their devotions in the churches, whence the name wake. In honour of the occasion rushes and flowers were scattered on the floor of the church, and the altar and pulpit were garlanded with leaves and blossoms. The day following the vigil was devoted to feasting and merry-making, tents being put up in the churchyard to supply the parishioners with food and ale. The second part of the festival appears to have been that which was most appreciated by the populace, and the term wake came to be applied to it alone. Wakes gradually became the occasions of boisterous merry-makings, and where the saint was of high repute the inhabitants of neighbouring parishes flocked in large numbers to his annual festival. As was natural, the large crowds thus drawn together attracted swarms of hawkers and merchants, until the wake or dedication festival degenerated into a common fair, without any religious element in it. To remedy some of the more glaring evils which had arisen, Edward I. in 1285 passed a statute forbidding wakes to be held in churchyards; and in 1418 Henry VI. enacted that no display of wares and merchandise should be allowed on the great festivals of the church. In 1536 Henry VIII., by an Act of Convocation, ordered that the festival of the dedication should be held in all parishes on the same day—viz., the first Sunday in October, and the result of this enactment was that it gradually fell into desuetude. The saint's day, however, which was the more popular festival of the two, remained unaffected, and in the "Book of Sports" of Charles I. wakes are expressly mentioned among the feasts which should be observed. After the Restoration the custom gradually declined, but it still survives to a small extent in some of the rural parishes and villages of England.

A *lyke* or *liche* (Old Eng. *lic*, Ger. *leiche*, corpse), wake, is a watching of a corpse all night by the deceased's friends, relatives, and neighbours. The custom no doubt originated either out of the dread of passing a night alone with a dead body, or from some fear of its being disturbed by evil spirits. This kind of wake is still retained among the lower orders of the Irish. In Ireland, upon the death of one in humble circumstances, the body, laid out and covered with a sheet, except the face, and surrounded by lighted tapers, is "waked" by friends and neighbours. After vociferous lamentations from the women, food, tobacco, and whisky are indulged in, and as the latter makes its influence felt noisy and even riotous demonstrations are apt to result. The efforts of the Roman Catholic clergy have long been directed towards the suppression of this unseemly and pernicious custom, but its popularity is such that up to the present their labours have only met with partial success.

**WAKEFIELD**, a market town and municipal and parliamentary borough of England, in the West Riding of Yorkshire, 29 miles south-west from York, and 175½ from London, standing on the north-west bank of the Calder, at the point where the Barnsley Canal enters it on the opposite side. It is connected by canal with Hull, and by railways with all the chief towns in Yorkshire. The Great Northern has a splendid station here, which also serves for the Midland and other lines. The town consists of several spacious and regular streets formed of good houses. The woollen and worsted manufactures, introduced early in the eighteenth century, and formerly very extensive here, have been to a considerable degree transferred to Halifax and Bradford. The chief manufactures now are iron and brass founding, and the making of steam-engines, malt-making, boat and

sloop building, rope-making, and dyeing. There is a large agricultural trade in corn, wool, and cattle. The town contains a large house of correction for the West Riding, extensive corn magazines, a large market, an hospital, a lunatic asylum, a wharf, the West Riding proprietary school, a fine arts' institute, a free grammar-school, a spacious corn exchange, and a fine parish church, consecrated by Archbishop William de Melton in 1329, and thoroughly restored and the spire rebuilt in 1867. There are several other churches, the most remarkable of which is a chapel on the bridge over the Calder, built by Edward IV., and numerous dissenting chapels. It is proposed to make the town the see of a bishop. The great battle of Wakefield was fought 31st December, 1460. Among the eminent natives of the town have been Archbishop Potter, Dr. John Radcliffe, Dr. Burton, Joseph Bingham, and Robert Bentley. The municipal borough is divided into seven wards, and is governed by eight aldermen (one of whom is mayor) and twenty-four councillors. The population in 1881 was 31,566. The parliamentary borough returns one member. Its limits are co-extensive with those of the municipal borough.

**WALA, LAY OF** (the Wöluspa), one of the most interesting and famous poems of the older Edda. It is the song of the prophetess Wala or Wöla, narrating the Norse myths of the creation, of the gods, and of the final destruction of the whole universe, to All-father Wotan (Odin), who had raised her from the dead to tell him things which he, though king of gods, found dim to his own thought. Among other things Wala foretold the death of Baldur, "the shining one," the great catastrophe of the Norse mythology.

**WALCHEREN**, an island of the Netherlands, in the province Zeeland, between the east and west Scheldt, separated from the islands of North and South Beveland by the Veersche Gat and the Sloe. It is 10 miles long by 8 miles wide. Its surface is quite flat and below the level of the water, and it is protected from inundations by sand-hills and great dykes. Excellent crops of wheat and madder are produced, and it is the most productive of the islands of the Netherlands. Middelburg (the capital) and Flushing are its principal places. Sir Philip Sidney was governor of Walcheren when he fell at the battle of Zutphen. It is celebrated as the scene of the famous Walcheren expedition during the wars with Napoleon I. Great Britain had agreed to aid Austria by making diversions upon Holland and Italy. Selecting for the service General the Earl of Chatham and Admiral Sir Richard Strachan, Lord Castlereagh gave them a fleet of seventy-nine ships of the line and thirty-six frigates and an army of 40,000 men, directing them to take Flushing, on the south coast of the island, which Napoleon had strongly fortified, to burn or capture the French shipping in the Scheldt, and to destroy the naval establishment at Antwerp, on which Napoleon had spent millions. They took Flushing, and occupied Walcheren (15th August, 1809), and then, instead of moving upon Antwerp, they stayed in the unhealthy island until swamp fever had taken away the best part of their force. The following epigram appeared at the time:—

Lord Chatham, with his sabre drawn,  
Stood waiting for Sir Richard Strachan;  
Sir Richard, longing to be at 'em,  
Stood waiting for the Earl of Chatham.

**WALDECK**, formerly a principality in the north of Germany, situated between Westphalia, Hesse-Cassel, and Prussia, had an area of 466 square miles. It is a mountainous country, without any wide valleys. The climate is colder than that of Hesse under the same latitude, but the air is pure and healthy. The soil is in general stony and sterile, yet the industry of the inhabitants raises corn, potatoes, and flax enough for their own use. There is a great quantity of timber, and in some parts good pastures, on

which numerous herds of cattle are fed, and considerable quantities of butter and cheese are made. Sheep and swine are kept in large numbers. The minerals are copper, iron, lead, alabaster, marble, slate, freestone, and salt. The inhabitants make some coarse woollen cloths and linen for their own use, but none for exportation. Leather, paper, and iron are also manufactured in considerable quantities. The county of Pyrmont belonged to Waldeck. From the town of Pyrmont large quantities of mineral waters are exported. The House of Waldeck was one of the oldest in Germany, and their estates were at one time very extensive. At the Congress of Vienna in 1815 the above territory was assigned to them on account of the distinguished services rendered by Field-marshal Prince George of Waldeck in the wars against France. From that time to 1866 Waldeck formed part of the Germanic Confederation. After the battle of Sadowa it was for a short time a member of the North German Confederation, but by a treaty which came into operation in 1878 it was virtually annexed to the kingdom of Prussia, though nominally only for ten years.

**WALDEN'SES or VALDENSES** (in Lat. *Vallenses*; *Valdèsi* in Italian; *l'audès* in their own dialect), a remarkable people, who form a communion separate from the Roman Catholic Church, and who are found chiefly in three high valleys of Piedmont, on the eastern or Italian side of the Cottian Alps, between Mount Viso and the Col de Sestrières. The valleys are—(1) that of Lucerna, through which flows the Pelice, an Alpine torrent which falls into the river Clusone; (2) the valley of Perosa, through which passes the Clusone, which rises in the Col de Sestrières, flows south-east by Fenestrelle, Perosa, and near Pinerolo, and, after receiving the Pelice, joins the Po a few miles further down; (3) the valley of San Martino, which branches out of that of the Clusone, along the course of a torrent called Germanasca. Of these three valleys, the southernmost, that of Lucerna, is tolerably productive: gardens and vineyards, orchards, cornfields, and pastures, are seen in pleasant succession; but the other two are little favoured by nature. The inhabitants grow some corn and maize; they have also sheep, goats, and cattle, but not many horses. Silk-worms are reared in some places, and silk is made. The farmers are mostly métayers; that is to say, they pay to the land-owner half the produce of the ground, either in kind or money. Most of the peasantry have with their cottages a few rods of land of their own; some are possessed of a few acres. The three valleys together comprise an area of about 22 miles in length from north to south, and 18 miles in width from east to west, confined between the right bank of the Clusone and the left bank of the Pelice. The population amounts to about 20,000 individuals. The Waldenses are distributed in thirteen parishes, each having its pastor. The principal villages are—La Torre, in the valley of the Pelice, or Lucerna, with about 2000 inhabitants; San Giovanni, Angrogna, Bobbio, and Villaro, in the same valley; Pomaretto, in the valley of the Clusone; San Martino, Villasecca, and Perera, in the valley of the Germanasca. In every parish there is a church and a school. The origin of the name Waldenses, or Valdèsi, is supposed by some to be derived from the word *rallis*, and to mean inhabitants of the valleys; but by others it is traced to Peter Waldo, or Valdo, of Lyons, a merchant who was a religious reformer, and being condemned by the archbishop of that city in 1172, was obliged to leave his own country. The **ALBIGENSES**, properly so called, were quite distinct from the Waldenses.

Probably an opposition to the Roman Catholic Church, not unlike the Albigensian movement, existed in some of the Alpine valleys prior to 1172, but it was through the labours of Peter Waldo that it first assumed historical importance. This reformer, by the study of the Bible and the writings of the fathers, conceived an ardent desire

to bring back the church, which, in her external appearance, seemed to him utterly corrupt, to primitive and apostolical purity. He gave all his possessions to the poor, began public preaching, and collected a body of associates, who were commonly called the "Poor of Lyons," *Leonistæ* (from the name of that city), *Sabatati* (from their wearing wooden shoes or sandals), or *Humilitati* (from their humility). Their aim was to reform the church rather than to separate from it, but when the Archbishop of Lyons commanded them to be silent, and Pope Alexander III., disregarding their appeal, likewise forbade their meetings, they declared they must obey God rather than man, and in consequence they were, in 1184, formally excommunicated by Pope Lucius III. In spite of this the movement spread throughout Southern France, Italy, and Bohemia, and its adherents became very numerous in Provence and in the valleys of Piedmont. In 1230 Reinerus, a Dominican friar, in a treatise against heretics, "*Opusculum de Hæreticis*," says of the Waldenses that "they reject whatsoever is taught if it is not demonstrable by a text in the New Testament," and he goes on to enumerate many places where they have churches and schools, showing that at this time their doctrines were received in many districts on both sides of the Alps. As the action of the church grew more hostile their opposition became more pronounced, and very soon they became the objects of much persecution. As early as 1242 they were condemned by the Synod of Tarragona, and large numbers of them were put to death. They were again made the objects of special persecution in 1332 and 1400, and in 1477 Pope Sixtus IV. proclaimed a crusade against them in their headquarters in Savoy. In consequence of this many of them became dispersed throughout Europe, until it was said they were to be found in every town between Antwerp and L. . . . Those in Bohemia united themselves with the Hussites, especially the Tabornites, and with the Bohemian brethren. The persecution of the Waldenses of Piedmont continued with but rare interruptions throughout the sixteenth and seventeenth centuries. One of the attacks made upon them in 1655 was attended by such hideous atrocities, perpetrated chiefly by the French and Irish mercenaries in the service of the Duke of Savoy, that the indignation of Protestant Europe was aroused. Milton in England gave expression to his feelings in a well-known sonnet, and Cromwell interposed on their behalf with so much effect that the massacre was stopped and a convention was concluded allowing them to exercise their worship. In spite of this they were again attacked in 1686 by a French and Italian army, the former sent by Louis XIV., who had just expelled the Protestants from France, and 3000 were killed, 10,000 taken prisoners, and 3000 of their children distributed in Catholic towns and villages. Indeed till the present century their history is mainly comprised in heroic struggles against superior forces, and in bitter sufferings endured for conscience' sake. When Napoleon annexed Piedmont to France he placed the Waldenses on a footing of equality with their Roman Catholic countrymen, and assigned funds for the support of their clergy. They were stripped of these privileges after his fall, but the King of Sardinia, at the instance of the Prussian government, gave to each of their ministers a small fixed salary. About 1826 the Prussian government began to interest itself more actively in their behalf and to aid them in the erection of churches and schools, but they continued to be excluded from all civil and military offices till 1848, when Sardinia granted them full religious and ecclesiastical liberty, and equality of civil and political rights with the Roman Catholics. Until 1848 they were confined to three retired valleys of the Cottian Alps—Lucerna, Perosa, and San Martino; but they have since organized new congregations in all parts of Italy. In 1848 Turin became the centre of many of their operations; but when all Italy was opened to them by the subsequent

revolutions, they fixed upon Florence as the centre of their denomination, and consequently the theological seminary was removed thither in 1860, and the printing press, with the publication of their peculiar organ, in 1862. They have been especially active in the publication of religious books, and in 1861, in order to extend this field of their labour, an Italian evangelical publication society was formed. They have now several professors in the theological seminaries of Florence and colleges of La Tour and Pomaret; an hospital at each of the last two places; a superior school for young men, a normal school, a grammar school at Pomaret, and a company of theological students at Florence. Four journals are published, three in Italian and one in French. At the present time the Waldensian Church in Italy, besides sixteen parishes in the valleys, has over forty settled congregations, ten missionary stations with fifty outposts occasionally visited, twenty ordained ministers, ten licentiates, fourteen schoolmaster-evangelists, fifty-three other teachers, five colporteurs, and 2100 communicants. In Rome the Waldenses have an organization and a church edifice, and Sabbath and other schools. There is a Waldensian colony at Rosario in the Argentine Republic. In doctrine and church constitution, the Waldenses approach nearest to the Reformed Church of France. They recognize the Bible as their only rule of faith, and believe their "Confession of Faith," published in 1655, to be the most correct expression of Biblical theology. With regard to the Lord's supper they agree with the Calvinists, but they have not adopted the doctrine of absolute predestination. In their public services they use the Bible, and especially the Psalms. Their synod consists of all the ministers and twice their number of lay delegates, who, however, cast only an equal number of votes with the clergy. The meetings are annual.

**WALD'HORN.** See *IM'NICH HORN*.

**WALDO, PETER,** a reformer of the early date of the twelfth century. He was a silk merchant of Lyons, and became rich in his trade. Then becoming converted he gave his goods to the poor, gathered like-minded pious men about him, who called themselves the Poor Men of Lyons, but who were generally then called by others Waldenses, after the name of their chief, though this name now might cause ambiguity with the Swiss or Vaudois. Waldo translated the Bible into the Provençal of the South of France, gave it to his followers as their sole rule of life, exactly as sincerely as the same thing was done by our own Puritan ancestors five centuries later. This simple faith and moral system he opposed to the subtleties and corruptions of the Roman Catholic Church. Waldo died in 1179. In that very year a general council of the church was held at Rome, and the Waldenses, who had suffered somewhat, sent representatives from their body to that council, bearing their psalter and Bible in their own tongue, the work of Waldo, and begging the Pope's license to use them. Although a large party at the council, including our own Walter Map, delegate of King Henry II. of England, urged that "Water should be taken from the spring (i.e. the *Vulgate*), not from the marshes," yet the proposed interdiction was not carried. Fifty years later Rome was sterner, and forbade the Scriptures to be studied in the vernacular, depriving many good Christians of the spiritual food good Peter Waldo had prepared for them.

**WALES,** a principality of Great Britain, lies on the west side of the island, between 51° 20' and 53° 25' N. lat., and 2° 41' and 5° 18' W. lon. It is bounded W. and N. by St. George's Channel, E. by Cheshire, Shropshire, Herefordshire, and Monmouthshire, and S. and S.E. by the Bristol Channel. Its greatest length north to south is about 180 miles; its breadth east to west varies from 50 to 80 miles. It contains 7,363 square miles. The population in 1881 was 1,066,513. The counties and chief towns are described under their respective names. In consequence,

however, of its very intimate connection with England, and its marked physical features, it may be as well to give a short additional description here.

**Physical Aspect.**—Wales consists of a peninsula, with the island of Anglesey situated at its north-west extremity, and separated from it by the Menai Strait (now crossed by two very remarkable bridges), and with numerous smaller islands chiefly at a short distance from the south-west coast. The surface is very mountainous, particularly in the north, where Snowdon, the culminating point of South Britain, rises to the height of 3590 feet; it is intersected by beautiful valleys, traversed by numerous streams, including, among others, the Severn, which has its source within the principality, and is rich in minerals, particularly copper in the north and coal and iron in the south. Slate also abounds in the north. The Silurian formation covers more than two-thirds of the whole area, extending continuously from the mouth of the Conway to the vicinity of St. David's Head; but is succeeded in the south by the old red sandstone, above which lie, first the mountain limestone, and then a large and valuable coalfield.

**Rivers, Soil, and Climate.**—Besides the Severn the principal rivers are the Dee, which has part of its lower course in Cheshire; the Clwyd, in Denbigh and Flint; the Conway, forming the boundary between Denbigh and Carnarvon; the Dovey, and the united Rhedidol and Ystwith, which have their mouths near the centre of Cardigan Bay; the Teify, separating Cardigan on the north from Carmarthen and Pembroke on the south; the Cleddy and Cledden, remarkable chiefly from contributing, by their junction, to form the splendid estuary of Milford Haven; the Towy and Bury, which both fall into Carmarthen Bay; the Ebrv and Taff, which have a common estuary in the Bristol Channel; the Romney, which forms part of the boundary between Wales and England; and the Usk and Wye, which, though rising in the principality, have only the first part of their course within it. The lakes are numerous, but the largest, that of Bala, is only 4 miles long, and scarcely 1 broad. The climate is on the whole moderate and equable, though somewhat keen in the loftier districts. In all the counties, but more especially on the sea-coast, humidity is in excess, the average fall of rain being 34 inches, while that in England is only 22. Hence both climate and surface concur in rendering Wales much better adapted to pasture than agriculture. The soil seldom possesses great natural fertility, except in some of the vales, of which those of the Clwyd in the north, and of Glamorgan in the south, are celebrated for productiveness. The latter, rather a plain than a valley, is of great extent, and produces excellent wheat. The farms are generally small, and more than one-half of them are tilled by the occupiers without the assistance of labourers. A hardy breed of small ponies is reared, especially in the counties of Merioneth and Montgomery.

**Minerals, Manufactures, and Commerce.**—The principal manufacture is that of iron, which is chiefly confined to Glamorganshire. Large quantities of ore are raised in that county, where some of the most extensive smelting furnaces in Great Britain are found. The quantity of pig iron produced in the principality is very large. The principal iron works are at and around Merthyr Tydvil, Tredegar, and Aberdare. Copper ore, brought from Cornwall and other parts of England, from Ireland, and foreign countries, is smelted in immense quantities at Swansea. The great coalfield of South Wales affords employment to a large number of hands; and besides being locally used in the iron manufactures and copper-smelting, the produce is exported from Cardiff and other ports to all parts of the world, being especially adapted for steamers. North Wales also yields coal and iron, from the vicinities of Wrexham and Ruabon in Denbighshire. Lead (with some silver ore) and copper are raised in Anglesey, Cardiganshire, and other parts of Wales, as well as large quantities of slate, lime-



stone, and marble. Various manufactures in lead, iron, copper, and brass are carried on at Holywell, in Flintshire. The principality has long been famous for its flannels, which are manufactured in large quantities in Montgomeryshire and other parts of the north, besides stockings, coarse cloth, cotton goods, and flax.

The commerce consists principally in the export of mineral produce, slates, cattle, and wool. The principal ports are Swansea, Newport, Cardiff, Carnarvon, and Beaumaris, besides which Holyhead is a chief packet station for communication with Ireland, and Milford is a naval port, and the seat of a government dockyard.

*Divisions.*—Wales is in the ecclesiastical province of Canterbury, and is divided into the bishoprics of Llandaff, St. David's, Bangor, and St. Asaph. Since the Reform Act of 1885 it is represented in the House of Commons by thirty-six members.

Since the passing of the 11 Geo. IV. and 1 Will. IV. c. 70, Wales has no jurisdiction in legal matters distinct from England. It is divided into two circuits—North Wales and South Wales—and one judge travels each. North Wales includes Anglesey, Carnarvonshire, Denbighshire, Flintshire, Merionethshire, and Montgomeryshire. South Wales includes Brecknockshire, Cardiganshire, Carmarthenshire, Glamorganshire, Pembrokeshire, and Radnorshire.

*History.*—When the Romans invaded Britain in A.D. 43 Wales was inhabited by a non-Aryan people of unknown origin, divided into three tribes. The Ordovices occupied the northern part and the island of Mona (Man), the Demetri the western part, and the Silures the central and southern parts. The Silures were the most numerous and powerful. The country was repeatedly invaded by the Romans, and Caractacus, king of the Silures, was captured and carried to Rome. There seems every reason to believe that the short, dark-haired, dark-eyed, long-headed Silures were the remains of the Neolithic inhabitants of Britain, that race with improved stone weapons and implements who drove out the Palæolithic aborigines of the earliest stone-age, and who were driven into their mountain fastnesses by the men of the "bronze" age, tall men of the fair Finnish or Slavonian type, with heavy overhanging brows and prominent cheek-bones. When the Celtic (Aryan) invasion came, fair oval-headed men, the bronze men were driven north, to become the Picts of later days; and the dark Silures, while holding their own Welsh and Cornish mountains, succumbed to the victorious Cymry, were intermixed with them, and adopted their language. Later still, in Cæsar's time (B.C. 54), the Gauls were found to have conquered a large part of eastern and southern Britain, driving the Cymric Britons westward, and still further intensifying the Cymric element among the Silures. A century later (A.D. 43), when the Emperor Claudius undertook the conquest of Britain, many customs, unknown to either Celtic or Teutonic usage survived, doubtless derived from the Silurian peoples (as "borough-English," &c.), and even to this day there are many country usages existent to remind us of the times before the Celt was in our land. The ancient Britons were therefore Cymry, largely mixed with Gauls; the ancient Welsh were Silures largely mixed with Cymry, and eventually adopting the name as well as the language of the latter. Though many times overrun Wales was not subdued, and remained a place of refuge for those Britons who fled from the Roman rule. Many more, later on, fled thither from the invading English (Teutons by race), and, becoming incorporated with the original inhabitants, finally formed a people who have in many places preserved their language and customs to the present day. The origin of their name Cymry has been long discussed, but no generally admitted result has been attained. After the Romans abandoned Britain, in the early part of the fifth century, the Welsh were engaged with

varying fortune in continued contests with the English. The men of Wessex cut off the Cornish folk, and in 607 Æthelrith of Northumbria, by the victory at Chester, cut off Cumbria from North Wales. In the latter part of the eighth century Offa, king of Mercia, constructed a dyke, traces of which remain, from the mouth of the Dee to the Wye, as a defence against the Welsh. Cumbria and West Wales were gradually absorbed into England, but North Wales—that is what we now call simply Wales, long remained independent, or nearly so. It was divided into a number of petty kingdoms, and was repeatedly ravaged by the Danes. During the ninth century it was nearly all brought under the dominion of Roderick the Great, who divided it into three principalities, Gwynedd (North Wales), Dyfed (South Wales), and Powys (parts of Montgomeryshire, Shropshire, and Radnorshire), which on his death (about 875) he left to his three sons. About 930 Athelstan, king of England, reduced the country so far as to compel it to pay an annual tribute. About 940 it was again united under one king, Howel Dda (the Good), who reformed and digested its laws. On his death it was again divided, and from this time the Welsh people were continually engaged in war with the Danes and the English, or in civil strifes. Just previous to the Norman Conquest they were compelled to pay tribute to King Harold. They refused the tribute to William the Conqueror, and he invaded the country and reduced them to submission, planting a line of fortresses along the borders, held by great barons, to whom he left full liberty to hold as much of the neighbouring land in submission as they could. From this time the English kings claimed Wales as part of their dominions, but the claim was constantly resisted, and the country was also distracted by intestine warfare. Llewellyn ap Iorwerth (1195–1246), a prince of the house of Gruffydd ap Conan, lord of Snowdon, rose to supremacy in Wales, and when the brave Welshmen once had a head they quickly drove out their English invaders, and again and again defeated all attempts to subdue them. Henry II., after being more than once in mortal peril at their hands, at last desisted. The Welsh bardic songs exult with triumph over the many brave deeds and glorious successes of Llewellyn. In 1267 Llewellyn ap Gruffydd (1246–82), almost as great a prince as his name-ake and predecessor, having obtained the sovereignty of the greater part of Wales, and having defeated the English in battle and inflicted great damage on their territory, was acknowledged as prince of Wales by Henry III., and a treaty was concluded. In 1275 Edward I. summoned Llewellyn to a Parliament at Westminster. Soon afterwards Eleanor de Montfort, daughter of the great Earl of Leicester and betrothed to Llewellyn, was made prisoner by Edward when on her way to Wales. Llewellyn refused to comply with the summons unless she was released and hostages for his own safety were given. War immediately commenced, and Llewellyn was compelled to conclude a peace on humiliating terms (1277), agreeing to a large reduction of power, and that at his death his whole realm should pass to the English crown. Eleanor was released and married to him. In the spring of 1282 Llewellyn again rebelled, but the great Edward was thoroughly roused and threw his whole energy into the conquest of his turbulent vassal. After a stubborn resistance he was defeated and slain in December. His brother David, who claimed to succeed him, was captured and executed as a traitor at Shrewsbury the next year, and by the statute of Rhuddlan (12 Edward I., c. 5) Wales was united to England. The title Prince of Wales was, later on (in 1301), given by Edward to his second son, the future Edward II., who was born in Carnarvon Castle, 25th April, 1284, and has ever since been borne by the eldest son of the English sovereign. Rebellions against the English rule broke out in 1287, 1294, and 1315, but they were suppressed and their leaders executed. In 1400 the Welsh,



led by Owen Glendower, during the troubles at the beginning of the usurpation of Henry IV., made their last attempt to recover their independence. They maintained the struggle until Glendower's death in 1415. The laws of Wales were now gradually assimilated to those of England, until in 1536, by the statute 27 Henry VIII., c. 26, the complete identity of the two countries in all essential points was established; and in the reigns of George IV. and William IV. the last traces of political distinction were abolished.

#### WALES, LANGUAGE AND LITERATURE OF.

See WELSH LANGUAGE.

#### WALES, NEW SOUTH. See NEW SOUTH WALES.

**WALES, PRINCES OF.** The common idea is, that the title of Prince of Wales is the hereditary title of the eldest son of the reigning sovereign; but this is an entire misconception. As a matter of fact every heir-apparent of the English crown owes the title of Prince of Wales to an act of special creation in his individual case, often for some years delayed, in one case not taking place at all.

The first Prince of Wales, as everybody knows, was the unfortunate prince, afterwards styled Edward II. The story runs that, to reconcile the Welsh people to their subjugation and to the recognition of the sovereignty instead of the mere suzerainty of the English king, Edward I. promised them a prince born in their country and unable to speak a word of English. He kept his promise, says the legend, by presenting to them his son Edward, an infant recently born in Carnarvon, and certainly ignorant of English, but just as ignorant of Welsh. At his birth the baby Edward was the second son of Edward the Great. But as the heir-apparent, Alphonso, died in childhood, his younger brother Edward became heir to the throne. It was not, however, till the year 1301, when he was seventeen years of age, that he was created Prince of Wales. If at that time he was unable to speak a word of English, though no doubt he spoke Norman-French better, his education must have been very backward.

Edward III., who succeeded his murdered father when he was but fifteen years of age, was never created Prince of Wales. The title he bore before his accession was that of Earl of Chester, always afterwards associated with the princely title. His eldest son Edward, known as the Black Prince—from the colour of his armour, say the writers, though the colour of his conduct in his later years would have supplied as good an origin—was created Prince of Wales in 1343, when he was thirteen years of age. By this prince the three ostrich feathers and the motto "Ich Dien," taken (according to a tradition nearly as doubtful as the Carnarvon legend) at the field of Crécy from the blind King John of Bohemia, are said to have been adopted as the symbol and motto of his dignity. The death of the Black Prince a year before his father was followed by the nomination of his son Richard as Prince of Wales. This is one of the two instances of the title of Prince of Wales being borne by the grandson of the reigning sovereign, the other being that of George, Prince of Wales, afterwards George III. Richard II. left no children, and the next Prince of Wales was the son of Henry IV. This was the madcap Prince Hal of *Shakespeare*, the companion of Falstaff and rival of Hotspur. Henry VI. succeeding his father when an infant of nine months, was never created Prince of Wales. Next we have in rapid succession the two murdered princes of Wales, sons of the rival monarchs, Henry VI. and Edward IV.—both Edwards; and a third Edward Prince of Wales, whose early death is said to have been an wounding grief to his father, Richard III.

The other princes of Wales are Arthur, son of Henry VII., who died at sixteen; his younger brother Henry, afterwards Henry VIII., who was not, however, created Prince of Wales until after a delay sufficient to show that his brother had left no issue; and Edward, afterwards

Edward VI., son of Henry VIII.; Henry the eldest son of James I., and Charles, his third but next surviving brother, afterwards Charles I.; Charles, afterwards Charles II.; and, though not by allowed title, James, the son of James II., the elder Pretender, and his son, Charles Edward, the younger Pretender. We are then brought happily and by rapid steps to the dynasty which now sits on the throne. William and Mary were childless. Anne's children died before she was queen.

George I. of course never held this title; but on his becoming King of England he at once created his eldest son George Prince of Wales. The prince was then thirty-two. The scandalous division between king and prince is matter of history, and was repeated to even greater extent in the next reign. The hatred which George I. felt for his eldest son was as nothing compared with the hatred which George II. and his queen had for their Prince of Wales. Of him his mother said to Lord Hervey: "My dear lord, I will give it to you under my own hand that my dear first-born is the greatest ass, and the greatest liar, and the greatest *canaille*, and the greatest beast in the whole world, and that I heartily wish he was out of it." As for the nation, its opinion of Prince Frederick was summed up in a witty lampoon which is universally known—

"Here lies Fred,  
Who was alive and is dead.  
Had it been his father,  
I had much rather;  
Had it been his brother,  
Sooner than any other;  
Had it been his sister,  
There's no one would have missed her;  
Had it been his whole generation,  
Best of all for the nation;  
But since it is only Fred,  
There is no more to be said."

At his death Frederick, Prince of Wales, left a son (George, thirteen years old (afterwards George III.)), who was almost at once created Prince of Wales in his stead. Since then there have been only two princes of Wales, he who was afterwards George IV., and our own Albert Edward.

On 8th January, 1885, when Albert Victor, eldest son of Albert Edward, Prince of Wales, attained his majority, we saw for the first time in English history a sovereign, a prince of Wales, and the eldest son of that prince, all of full legal age; and what is perhaps no less remarkable, all of them highly popular with the nation, and all united in happy bonds of family relationship. Thus did Victoria and her son supply the needed exception to that bitter rule of Lord Stanhope—"The heir-apparent to a crown seldom fails to be hated by the monarch in proportion as he is loved by the nation."

**WALHALLA**, the hall of the spirits of heroes fallen in battle (*val*, a heap of slain), one of the myths of the Norse mythology. It was a huge structure, with 540 vast portals, each admitting hundreds of heroes abreast. If a leader fell in battle, surrounded by his faithful comrades, the latter also escorted his spirit to Walhalla; consequently it was not unfrequent in early Norse times for followers to fall upon their swords rather than survive (and so desert) a favourite leader. The amusements of the heroes in Walhalla were perpetual fighting and feasting. All wounds healed, and good temper returned at the time of the banquet, and the fighting was resumed with fresh zest on the following morning. The boar which was daily slain and devoured, also daily came to life anew. Wotan's coat of arms, the wolf and the eagle, hung before the main front of Walhalla; its roof was made of gigantic spear shafts, covered with shields for tiles; the couches were spread with fine chain mail instead of rugs.

WALHALLA, a magnificent Doric edifice and national temple of Bavaria, named from the mythic hall described in the preceding paragraph, was built by King Louis for the re-

ception of the statues of distinguished Germans, and for otherwise commemorating great national personages and events. It stands close to the village of Donaustauf, 6 miles east by north from Ratisbon, on the Danube, whose stream the façade overlooks, from a height of 328 feet.

**WALI** (son of Wotan and the lady Rinda, i.e. "rind" or crust of the earth), the spring-god in the Norse mythology, who avenged the death of Baldr, the "shining one" (the sun), by killing his murderer Hödur (winter) with an arrow. The shaft is of course the first sunbeam of spring.

**WALKER, FREDERICK** (1840-75), was an artist whose short life alone prevented him from founding a school of painting which would have given new impetus to English art. He had the rare power of perceiving the poetical and the idyllic side of ordinary rustic life. Much of his earlier work is in the form of book-illustration, but in the last years of his life he produced most beautiful and characteristic pictures. He was honoured with a special medal for some water-colours exhibited at the Paris International Exhibition of 1867.

**WALKING-STICK INSECT.** See PHASMIDÆ.

**WALKYRS** or **WALKYR IES**, the battle-maidens of the Norse mythology, were father Wotan's death-angels, pervading the battle with their flashing helmets and spears, the manes of their white horses dropping cooling dew, and their bright glances reviving the courage of the heroes. He who died bravely in battle was lifted on to her horse by a Walkyr and borne swiftly away to Walhalla, there eternally to feast and to fight in the presence of Father Wotan himself and of the other Ases (gods).

The Walkyrs generally rode in companies of three or four. Sometimes they would change to swan-like birds and fly above the heads of favoured heroes singing. If when they put off their feather-robe any one could steal it the Walkyr fell into his power and lost her divine nature. The most celebrated Walkyr is Brynhild, who disobeyed Wotan, and distributed victory and death in battle not as he had willed. For this offence she was doomed to marriage, which meant to a Walkyr the loss of her strength and supernatural powers. Wotan plunged her into a trance and surrounded her by a ring of fire, which long afterwards the hero Sigurd broke through and released her to become his wife.

**WALL, ROMAN.** See ROMAN WALL.

**WAL'LABA TREE** (*Eperua fulcata*) is a large timber tree belonging to the order LEGUMINOSÆ, suborder Cissalpinæ. It is abundant in the forests of British Guiana. It attains a height of about 50 feet, and has pinnate leaves and drooping clusters of red flowers. The wood is bright red-brown, with whitish streaks, hard, heavy, rather coarse-grained, resinous, and very durable. A decoction of the bark is used as an emetic by the natives.

**WAL'LACE, SIR WILLIAM**, the celebrated Scottish patriot, and in the popular belief the most illustrious champion of the national independence, was born in the second half of the thirteenth century, probably about the year 1270. Nothing certain is known concerning the family to which he belonged, but the oldest tradition extant relating to the hero makes him to be a younger son of Sir Malcolm Wallace, knight of Ellerslie. Concerning his education and early life also authentic history is silent, and the first indubitable glimpse that we obtain of his career is in the spring of 1297, when, at the head of a band of insurgents, he surprised and killed Haeselrig, the English governor of Lanark. At this period the Scottish king, John Balliol [see BALLIOL, JOHN], was a prisoner in the Tower of London as a revolted vassal, and the King of England, Edward I., who claimed to be the feudal overlord of Scotland, and to whom Balliol had done homage as such, was endeavouring to govern Scotland in his own absolute right, regarding it, as by strict feudal law he was perfectly right in doing, as a "lapsed fief." To this end, with his usual

excellent statesmanship, he had divided the country into districts, over each of which an English governor was placed. The affray at Lanark appears to have been the beginning of a general insurrection against the cobweb fictions of feudalism, which sanctioned the rule of the foreigner, in its nature inevitably more or less oppressive and irritating, and in a few months the English garrisons were driven out of the larger part of Scotland. Edward at the time was in Flanders, and his general, Warenne, earl of Surrey, was completely defeated by the Scots under Wallace in a great battle fought at Stirling in the September of 1297. The result of this victory was the withdrawal of the English and the submission of the kingdom to Wallace, who, however, merely claimed to rule on behalf of the absent and imprisoned John. During the winter Wallace crossed the border with his army, and almost without opposition ravaged Cumberland and Northumberland with fire and sword, returning to Scotland laden with plunder in the spring of 1298. Meanwhile, Edward had raised a powerful army, and placing himself at its head, he advanced northward, until on 22nd July, 1298, he came up with the Scottish forces under Wallace near Falkirk. Here a decisive engagement was fought, in which the army of Wallace was utterly defeated, with a loss, according to various historians, of 15,000 men. Wallace escaped after the battle, and though much obscurity rests over the next few years of his career, it appears certain that he carried on a guerilla warfare against the English during this period, and at one time went to Paris to seek assistance from the French king. When Edward offered pardon upon certain terms to the other Scottish leaders he excepted Wallace by name, and in 1301 he publicly declared him an outlaw. Large rewards were also offered for his apprehension, and he was ultimately betrayed by Sir John Monteith, who received from the Privy Council a grant of land of the annual value of £100 for this service. Wallace was carried in chains to London, and immediately upon his arrival he was put upon his trial for treason at Westminster Hall. He pleaded not guilty to the charge of treason, urging with justice that he had never been the vassal or subject of Edward, and that he had never taken any oath of fealty; but his death had been determined on, and he was duly condemned, being decorated with a crown of laurel in derision of his alleged pretensions to the throne of Scotland. On the 23rd of August, 1305, he was dragged at the tails of horses to the usual place of execution, the Elms, in West Smithfield, and there, in accordance with the barbarous customs of the times, he was hung, drawn, and quartered, meeting his fate with the most resolute courage and endurance. His head was exposed on London Bridge, and his limbs at Newcastle, Berwick, Perth, and Stirling.

It will be seen from the foregoing that the actual history of the public career of Sir William Wallace does not extend to more than a year and a half, his private life being little else than a blank. He had, however, made a deep impression upon the minds of his countrymen, and stories of his adventures and exploits began to be circulated after his death. Towards the close of the fifteenth century these popular stories were turned into poetry by the Scottish minstrel known as Blind Harry, and embodied in one long poem, which contains 11,861 lines of ten syllables, each written in rhyming couplets. In this poem the hero is furnished with a suitable parentage and education, and the periods of his life concerning which genuine history is silent are filled up with a series of romantic adventures, fierce personal combats, stories of great wrongs endured and savage reprisals taken, its climax being reached in the making of its hero invade England as far as St. Albans, Edward fleeing before him, and after threatening the metropolis and proving firm against the entreaties and blandishments

of the queen, making a treaty with Edward, by which the latter abjured his claims over Scotland. With respect to the personal character of the hero, while it cannot be denied that his invasion of the northern counties of England was attended with much robbery and slaughter, yet there is reason to believe he endeavoured to restrain rather than to excite the ferocity of his followers, while an extant letter to the corporations of Lübeck and Hamburg, inviting the merchants of these cities to resume their commercial intercourse with Scotland, shows that he sought the welfare of his country in matters beyond mere warfare. For the old accounts of Wallace see the works of Wyntoun, Fordun, and the poem of Blind Harry. A full modern account will be found in Tytler's "History of Scotland" and in the "Scottish Worthies" of the same author. See also Carrick's "Life of Sir William Wallace," and a paper on Sir William Wallace published by the Marquis of Bute (Paisley, 1876).

**WALLACE, WILLIAM VINCENT**, the musical composer, was born of Scottish parents, at Waterford, in 1815. His father was master of a military band, and his first impressions were of music; by this means his natural faculty was very early developed, so that in 1822 he showed considerable skill as a pianist. In 1827 he played the violin in the orchestra of the Dublin theatre; and in 1830, during the leader's temporary absence, he filled his place. His health failed him, and a sea-voyage was recommended as the only means for its restoration. He sailed therefore for Sydney in 1835, and was greatly benefited. For the next ten years his career was filled with romantic vicissitudes. He visited successively Van Diemen's Land, New Zealand, India, Valparaiso, Santiago, Buenos Ayres, Lima, the West Indies, Mexico (where, in 1841-12, he directed the Italian opera), New Orleans, and the other chief cities of the United States, and finally passed through London, Germany, and Holland. Tiger-hunts, shipwrecks, earthquakes, prairie fires, and other like perils intersperse the list of his artistic achievements during this eventful period; but the career upon which his extensive fame is founded may be said to have begun on his return to London in the spring of 1845. He published then some light pianoforte pieces, remarkable for their grace, which drew much attention to him, and he played the pianoforte in public with excellent effect. His particular ambition was to write for the stage. Accordingly, he chose a popular French drama—"Don Cesar de Bazan"—as the groundwork of his opera of "Maritana," which he produced with enormous success in November at Drury Lane Theatre; it is still deservedly a great favourite upon the stage. "Matilda of Hungary" (1847) was less fortunate than his first opera. Wallace continued to be active as a composer; but opportunity failing him to bring his works upon the stage, he grew impatient of his negative position here, and went to New York in 1849, not returning to England till 1853. His opera, "Lurline," written twelve years before, was brought out at the Royal English opera, Covent Garden, 22nd of February, 1860, and its reception was almost unparalleled. He never afterwards wrote anything so good. His other operas were the "Amber Witch" (1861), "Love's Triumph" (1862), and the "Desert Flower" (1863). He was now suddenly sent, because of his failing health, to the Pyrenees; but the remedy came too late, and he died there in 1865. His remains were brought home, and all the chief English musicians accompanied them to Kensal Green Cemetery, where they were interred. Wallace was a very conscientious writer, and would have undoubtedly produced noble work if the times had been more favourable. As it was, his life was almost frittered away.

**WALLACHIA.** See **ROUMANIA**.

**WALL-CREEPER.** See **CREEPERS**.

**WALL-CRESS** or **ROCK-CRESS**, are the common names of plants belonging to *Arabis*, an extensive genus

of the order **CRUCIFERÆ**. Nearly seventy species have been described. They are most of them small herbs with white or purplish flowers, fond of growing in dry stony places and on walls, whence their English name. Several are natives of Great Britain, and many of them are cultivated in gardens on rockwork and flower-borders, on account of their blooming early in spring.

**WALLENSTEIN** (or more correctly *Waldstein*), **ALBRECHT WENZEL EUSEBIUS, VON**, Duke of Mecklenburg, Friedland, and Sagan, one of the most remarkable of the statesmen and generals who owe their fame to the great **THIRTY YEARS' WAR**, was the third son of Baron Wilhelm von Waldstein, and was born in his father's castle of Hermanice, in Bohemia, 15th September, 1583. His parents, who were members of an ancient family, though they were not wealthy, were Protestants, and they entrusted the education of their son to the Moravian Brethren of Koschumberg, but the boy was passionate and stubborn, and he made but slight progress in learning. He was still a boy when his parents died, and his uncle, Albrecht von Slavata, a zealous Catholic, who became his guardian, placed him under the Jesuits at Olmutz, who speedily converted him to Catholicism. He continued his studies at Padua and Bologna, where he acquired a knowledge of the ancient and several European languages, of law, of mathematics, and other sciences connected with the military art; and a taste for astrology, in which he believed up to the end of his life. At Padua one of his teachers predicted that he would attain to great military renown, and anxious to see the prediction realized Wallenstein joined the imperial army, then warring against the Turks, and served with distinction under Basta until the conclusion of peace in 1606. In 1607 he married a wealthy Moravian widow, much older than himself, and by her death in 1614 he was left the proprietor of large landed estates.

In 1617 he raised a troop of 200 horsemen, with whom he assisted the Archduke Ferdinand of Austria, then at war with the Venetians. In a short time he found himself in command of several thousand men, and after the successful termination of the campaign at the end of 1617 the Emperor Matthias made him his chamberlain, and raised him to the rank of colonel in his armies. Immediately afterwards he married a daughter of Count Harrach, and the emperor on that occasion created him a count of the Holy Roman Empire. He allied himself to the clique that were striving to raise Ferdinand of Styria to the throne, and shared in their success when, on the death of Matthias in 1619, Ferdinand became emperor. Wallenstein at this time had been appointed general of the forces in Moravia, but when he refused to join the Bohemians against the emperor his troops deserted him, and his estates were temporarily confiscated. He managed, however, to carry off the military chest, and with part of the money he equipped a fresh regiment of cavalry, which took part in the battle of the White Mountain, near Prague, in 1620, in which the insurgents were completely defeated.

The emperor followed up his victory by a sweeping confiscation of the estates of the defeated Bohemian leaders, and ordered them to be sold by auction, Wallenstein becoming an enormous purchaser, and obtaining land valued at 20,000,000 florins for about 7,300,000, part of which was covered by his expenses incurred on behalf of the government.

In 1621 he took the field against Bethlen Gabor, the prince of Transylvania, whom he defeated, and to whom he granted peace on condition of his giving up his claim to the crown of Hungary. Two years later he again defeated Gabor, who had dangerously threatened the imperial army at Goding, and as a reward he was, in 1623, made a prince of Friedland, and in 1624 Duke of Friedland and Prince of the Holy Roman Empire. In 1625 the force of

the Catholic reaction was almost spent, and the emperor was menaced by a powerful coalition between the Protestant princes of North Germany and Denmark on the one side, while the Turks and Transylvanians under Bethlem Gabor threatened to overrun Austria from the east, and this at a time when the imperial treasury was empty and the imperial army disorganized. At this juncture Wallenstein offered to raise and equip an army of 20,000 men at his own expense, provided that he was appointed commander, with power to choose his own officers. This offer was readily accepted, and Wallenstein having raised the standard, the renown of his military skill, wealth, and liberality attracted, in a short time, more than double the number he had promised. At the head of these troops, composed very largely of mercenaries who had flocked to his camp from all parts of Europe, he attacked Mansfield at Dessau in the April of 1626, and drove him back with heavy loss through Silesia into Hungary. Mansfield died on his way to Venice to obtain subsidies, and by a series of successful manoeuvres Wallenstein dispersed the remnant of Mansfield's troops in Silesia, and defeated the Danish troops in repeated engagements until the Danish army was completely scattered and the North German coalition broken up.

Tilly, the leader of the Catholic League formed by Maximilian of Bavaria, being at this time temporarily disabled by a wound, Wallenstein was intrusted with the sole direction of affairs, and by the close of 1627 he had overrun Mecklenburg, Holstein, Schleswig, and Jutland. For these victories the emperor made Friedland a hereditary duchy, gave Wallenstein the Silesian dukedom of Sagan, and in 1629 made over to him the lands and titles of the two Dukes of Mecklenburg. He had now become the most powerful subject of the empire, but the following year there was a temporary ebb in the tide of his fortunes. In 1630 the emperor, desirous of having his son declared King of the Romans and successor to the throne, convened the electoral conference of Ratisbon. The electors, Catholic as well as Protestant, groaning under Wallenstein's enormous exactions, combined against him, and their efforts were sustained by Maximilian, duke of Bavaria, Tilly, and Father Joseph, a subtle and unscrupulous diplomatist who acted at Vienna as the agent of Richelieu. By this coalition the emperor was induced to dismiss Wallenstein from his command at the very moment when Gustavus Adolphus left Sweden for the invasion of Germany. Wallenstein accepted his dismissal with apparent resignation, and retired to Bohemia, where, attended by many of his best officers, he lived in princely state, doing much to improve the agriculture, manufactures, and education of his people.

Tilly, who succeeded him in command of the imperial army, was utterly routed by Gustavus at Breitenfeld, near Leipzig, in 1631, and the defeat spread terror over Austria. The further defeat and death of Tilly in the following year reduced the emperor to extremities, and he was compelled to turn to Wallenstein as the only man capable of saving the empire. Wallenstein took advantage of the emperor's need to make his own terms, the chief points of which were the repeal of the obnoxious Edict of Restitution, designed to restore to Catholicism all church property converted to Protestant uses since 1552, and the grant to himself of almost unlimited power as generalissimo of the empire.

By the spring of 1632 a new imperial army was ready for action, and by the end of May Wallenstein had driven the Saxons out of Northern Bohemia, and had thrown his forces upon Nuremberg. Gustavus, who had defeated Tilly a second time at the Lech, and had overrun Bavaria, hastened to the relief of Krisatz. For ten weeks the two great generals lay confronting each other in entrenched camps, each force enduring the extremities of hunger, hardship, and disease in the hope of wearying out

the other. At last, on 24th August, Gustavus made a desperate attempt to force Wallenstein's position, and failing in the attempt he shortly afterwards withdrew, leaving a strong garrison in the city. Wallenstein at once moved into electoral Saxony, and Gustavus hastened after him in rapid marches. The two armies met at Lutzen on 6th November, 1632, and one of the most desperate of the battles of the great war was fought, in which Gustavus and Pappenheim fell, and which was attended with frightful loss of life to both sides. Neither side could claim the victory, but in the night Wallenstein, whose army was crippled, retreated, leaving his artillery behind. Executing seventeen of his officers for cowardice, and rewarding those who had shown ability and courage, he passed the winter and spring in reorganizing his army, but found the Swedes almost as formidable as ever in 1633. He accordingly temporized and spent most of the year in negotiations, and at its close put his army in winter quarters in Northern Bohemia.

Meanwhile his enemies, headed by the Spanish ambassador Ouate, were busy at Vienna, and after considerable difficulty they succeeded in convincing the emperor that Wallenstein was acting in a treasonable manner. With great reluctance Ferdinand consented to his deposition, and by the beginning of February, 1634, Gallas, Piccolomini, Aldringer, Colloredo, and the other leading officers were secretly won over to the court. By 20th February Wallenstein found the news of his dismissal proclaimed to his most important garrisons, and on 22nd February, accompanied only by a few troops and a small number of officers, he set out for Eger. On the road he met Butler, an Irish Catholic who was in command of a regiment of dragoons, and commanded him to join the party. But Butler was already in treaty with Piccolomini, and the commanding officers of Eger had determined to take the side of the emperor, and on 25th February the generals Ilow, Törzky, Kinsky, and Neumann, who had remained faithful to Wallenstein, were assassinated at a banquet by a party of Butler's dragoons, while an Irish captain named Devereux, at the head of a few soldiers, burst into Wallenstein's bedroom and stabbed him to death with a halbert, as he stood calm and defenceless in his night-dress.

The character of Wallenstein has always been one of the vexed questions of German history. Förster, especially in his "Wallenstein before the Tribunal of the World" (1844), endeavoured to establish the general's innocence of all treachery to the emperor, and on the strength of his investigations, Count Waldstein-Wartenburg began an unsuccessful suit for the recovery of the estates confiscated at the general's death. Ranke's treatment of the subject is perfectly impartial and almost exhaustive. See his "Geschichte Wallensteins" (Leipzig, 1869). Schiller has enshrined the memory of the great commander in his noble drama, entitled "The Death of Wallenstein."

**WALLER, EDMUND**, an English poet, was born 3rd March, 1605, at Coleshill, in the county of Hertford. He was related to Hampden and Cromwell, and was still in his boyhood when his father died, leaving him an estate of £3500 a year, equal to about £10,000 of to-day.

He entered Parliament as member for Amersham and took the popular side, or at least professed to do so; but his political principles, if he had any, were of a very unstable and elastic nature, and, being detected in a plot to betray his party, he was fined and imprisoned, and afterwards exiled. After eight years spent in France and Italy, he was permitted to return to England; and on the death of Cromwell he wrote a eulogy on the Protector, one of the most graceful and at the same time one of the most vigorous of his poems. On the Restoration he welcomed Charles II. in another poem; and on the king remarking that it was inferior to his previous composition, he gave

the ready and witty reply, "Poets, sire, succeed better in fiction than in truth." He afterwards sat as member for Hastings, and served in all the Parliaments of the reign. He died of dropsy at Beaconsfield, where a handsome monument is erected over his remains.

The poetry of Waller was as over-estimated in his own day, and for a long time subsequently, as it has been undervalued at a later period. Atterbury spoke of him as "the parent of English verse," and Hume as the first refiner of English poetry, or at least of English rhyme; while a later critic has referred to his compositions as "a mass of smooth and easy, yet systematic trifling," a judgment too sweeping to be just. Occasionally vigorous and dignified, his lines are always graceful and harmonious, and he carefully refrained, even in his love songs, from trenching on the bounds of morality and religion. See the "Life of Waller" prefixed to Bell's edition of his poems (new edition, London, 1871).

**WALLFLOWER** (*Cheiranthus*) is a genus of plants belonging to the order *Cruciferae*. Many of the species exhale a delicious odour, and are great favourites in gardens. The most plentiful is the Common Wallflower (*Cheiranthus cheiri*), which is found wild throughout Southern Europe, on old walls and in stony places, and has been naturalized in Britain. The general colour is a brown yellow, or, as a poet has called it, the "yellow wallflower stained with iron-brown." It is, however, subject to considerable varieties of hue even in its wild state, and these are much increased by cultivation. On account of its scent, it has been transferred from ruined walls to the flower borders of gardens, and there, by the doubling of its flowers and the variations of its colours, a number of distinct varieties have been produced. Several other species of this genus have been described, and occasionally found in collections in gardens in this country. In their cultivation, the hardy shrubby species, such as the common wallflower, may be propagated by cuttings, which soon strike root when planted under a hand-glass; other perennial species will permit of growth by dividing the roots. The annual species may be sown in the open border or on rock-work, where they will flourish, and most of them will survive the winter in such a situation.

**WALLINGFORD**, a market-town and municipal borough in Berkshire, is 46 miles east by north from London by the road, or about 50 by the Great Western Railway, with which it is connected by a branch line. Wallingford is an ancient place, the earthworks with which the Romans encompassed it being still visible. It was called *Wælingford* by the Saxons. A castle was erected here at the time of the Conquest, but it was razed during the Civil War, and only a few remnants of its walls now remain. The town stands amid fertile meadows, at the point of intersection of a Roman way with the Thames, which is here traversed by a stone bridge 300 yards long. Wallingford consists of several streets, and has a very neat appearance, although some of the houses are old-fashioned. It formerly had fourteen churches, but now has only three (one of them partly Norman), four or five places of worship for dissenters, a spacious market-place, a town-hall, and market-house. A neat red brick and stone building was opened as a free library in 1871. The reading-room will accommodate 300 persons. The municipal borough is governed by four aldermen and twelve councillors, and had in 1881 a population of 2803. The separate parliamentary representation was absorbed in that of the north division of the county in 1885. The trade is purely agricultural.

**WALLIS, REV. JOHN, D.D.**, a distinguished mathematician, was the eldest son of the Rev. John Wallis, incumbent of Ashford in Kent, where he was born 23rd November, 1616. He was fifteen years old when his curiosity was excited by seeing a book of arithmetic in the hands of his younger brother, who was preparing for trade;

in a fortnight he had mastered the whole. He was entered at Emanuel College in Cambridge, where he soon obtained reputation. He was chosen fellow of Queen's, and took orders in 1640. He was then chaplain in one and another private family till the breaking out of the Civil War, in which he took the side of the Parliament. He made himself useful to his party by deciphering intercepted letters, an art in which he was eminent. In 1648 Wallis subscribed a remonstrance against the execution of Charles I. In 1649 he was appointed Savilian professor of geometry at Oxford by the parliamentary visitors. In 1655 his greatest work was published, the "Arithmetica Infinitorum," with a treatise on Conic Sections. At this time Hobbes thought he had solved the quadrature of the circle, and Wallis very cleverly showed him his error. Wallis refused to reprint his letters, witty and clever though they were, after Hobbes's death (1679).

In 1658 Wallis employed his art of deciphering on the side of the Royalists, so that at the Restoration he was received with favour by Charles II., and was made one of the royal chaplains. In 1661 he was one of the clergy appointed to review the Book of Common Prayer. He was one of the first members of the Royal Society. He died 28th October, 1703, in his eighty-eighth year.

As a mathematician he is the most immediate predecessor of Newton, both in the time at which he lived and the subjects on which he worked. His "English Grammar" (1653), written in Latin; and his "Logic" (1687), are eminently worth perusal, being ingenious and clever. He was the first to edit the musical treatises of Ptolemy, Porphyry, Aristarchos, &c., which are among the dim lights we possess as to the music of classical antiquity; and he gained great favour as a preacher in his own time.

**WALLIS' THEOREM**, invented by Dr. John Wallis [see preceding article], is a well-known ingenious expression for the ratio  $\pi$  of the circumference to the diameter of a circle, as:—

$$\frac{\pi}{2} = \frac{2^2 \cdot 4^2 \cdot 6^2 \cdot 8^2 \cdot 10^2 \cdot 12^2 \cdot \dots}{3^2 \cdot 5^2 \cdot 7^2 \cdot 9^2 \cdot 11^2 \cdot 13^2 \cdot \dots}$$

or more correctly

$$\frac{\pi}{4} = \frac{2 \cdot 4^2 \cdot 6^2 \cdot 8^2 \cdot 10^2 \cdot 12 \cdot \dots}{3^2 \cdot 5^2 \cdot 7^2 \cdot 9^2 \cdot 11^2 \cdot \dots}$$

**WALLOON** or **WAL'LOON** (i.e. Gall-oon), the corrupted language of the ancient Galli or Gauls, peculiar to the inhabitants of Hainault, Namur, Luxemburg, Artois, and part of Flanders and Brabant. The Romans having subdued Gaul, the natives applied themselves to learn the language of the conquerors, and thus introduced many Roman words and phrases into their own tongue. This Latinized Gaulish is called Walloon, and comes much nearer the simplicity of the ancient tongue than the Gaulish Latin of France. The Walloons are held to be superior in intelligence to their Flemish neighbours.

**WALL-RUE**. See ASPLENUM.

**WALLSEND**, a parish of England, in the county of Northumberland, is situated 4 miles E.N.E. of Newcastle, and is intersected by the Newcastle and Shields Railway. The town is large and well built, and has several churches and a temperance hall, and a population of 6351; the population of the parish in 1881 was 13,737, which is principally employed in the neighbouring collieries. Wallsend was formerly celebrated for its superior house coal, and the name is still used to signify all coal passed through a five-eighth inch sieve. The original colliery is now closed, the Tyne water having filled it.

**WALLSEND**, a town of New South Wales, Australia, in the county of Northumberland, 8 miles west of Newcastle. It has extensive coal mines.

**WALMER**, a small town and watering-place of England, in the county of Kent, 103 miles from London and

1 mile S.S.W. of Deal, in which municipal borough it is included. The population in 1881 was 41,309. The village of Upper Walmer adjoins Deal, and separated from it on the south-east is Lower Walmer, on rising-ground near the shore, containing the church, and resorted to for sea-bathing. Facing the sea, opposite the Downs, is Walmer Castle, the official residence of the Lord Warden of the Cinque Ports, where the Duke of Wellington died in 1852.

**WALNUT TREE** (*Juglans*) is a genus of plants belonging to the order JUGLANDACEÆ. There are four species, three of which are natives of North America and one of Asia. All are large trees.

The Royal or Common Walnut Tree (*Juglans regia*) is the oldest and the best known of the species. There is no history of its introduction into Great Britain, and it is only in the southern and middle parts of England that it brings its fruit to perfection. It is a native of Persia and the Himalayan region, and has long been cultivated in Southern Europe. It is a lofty tree, growing to a height of from 40 to 60 feet, with a large spreading top and a thick massive stem. The deciduous pinnate leaves have five to nine oval leaflets. The flowers are greenish, unisexual, and monoecious, the male flowers being in cylindrical drooping catkins, the female solitary or in a terminal cluster; they appear early in spring before the leaves. The fruit has a fleshy, greenish husk, which bursts irregularly to allow of the escape of the nut, which has a woody two-valved brown shell. The wood of the walnut tree is held in high estimation. It is much used by turners and by musical instrument makers, and for the mounting of guns. The wood of the young tree is white, and not much esteemed, but as the tree grows old it becomes solid, compact, and acquires a brown colour, beautifully varied and shaded with light brown and black. In almost every stage of its growth the fruit is used. When young, green, and tender, walnuts are pickled and preserved with the husks on. About the end of June they may be preserved with or without their husks. When they are fully ripe, which is generally at the end of September or the beginning of October, the kernel, deprived of its investing skin, is eaten in great quantities. As long as the skin can be easily removed they are a nutritious and healthy article of diet; but when they get dry, so that their skin sticks to them, they become indigestible. The albumen which constitutes the bulk of the seed of the walnut contains an oil, which is used in large quantities, especially on the Continent, by artists, and also for food and for lamps. The cake left after the expression of the oil is used either for human food or for feeding cattle and poultry. The husk of the fruit yields a dark-brown dye. In Circassia sugar is often made from the sap. The leaves have a balsamic odour when bruised, and are used medicinally in domestic practice. The walnut tree succeeds best on calcareous soils when grown for the sake of its fruit. It is propagated chiefly by sowing, and does not bear transplanting. Several varieties are in cultivation, one of which is called the Titmouse Walnut, because the shell of the nut is so thin that titmice and other birds can pierce it with their bills and eat the kernel.

The Black Walnut Tree (*Juglans nigra*) is a North American species, found in the United States, from New England to Florida, and especially abundant in the valley of the Mississippi. It is one of the first trees that was introduced from America to Europe, having been brought to England by the younger Tradescant in 1656. It is a rapid-growing tree, and attains a height of 50 or 60 feet in about forty years. It bears fruit in this country, which is very much inferior to that of the European walnut. The wood is strong, tough, fine-grained, and takes a beautiful polish; it is even more valuable than that of the common species.

The Gray Walnut or Butter-nut Tree (*Juglans cinerea*) is from North America. It is found in Upper and Lower

Canada, and in the temperate regions of the United States. This tree attains in its native regions a height of about 50 or 60 feet. The kernel of the nut affords a thick oil, which soon becomes rancid, and hence probably the names of butter-nut and oil-nut. The wood is also valuable. It was introduced into England in 1656.

**WALPOLE, HORACE**, fourth Earl of Orford, the prince of English letter-writers, third and youngest son of Sir Robert Walpole the statesman, by Catherine Shorter, his first wife, was born in Arlington Street, London, on the 5th of October, 1717. His father is said to have neglected him in childhood, while he was petted by his mother; but through life he displayed the greatest attachment to Sir Robert Walpole and his memory. At ten he was sent to Eton, where he formed a friendship with the poet Gray, which was strengthened by their intimacy at Cambridge. He was early placed in easy circumstances by sinecures procured for him by his father, which yielded him an annual income of several thousands. During a tour, chiefly in France and Italy (1739-41), in the first part of which Gray was his companion, Walpole's natural taste for art and his love of collecting objects of *vertu* were cultivated and indulged. On his return to England in 1741 he took his seat in the House of Commons as member for Callington. His father's long administration was tottering to its fall, and it was in defence of his father that Horace delivered, 23rd March, 1742, his maiden speech, as spirited as it was filial. He represented successively the boroughs of Callington, Castle Rising, and King's Lynn, finally retiring from the House in 1768. Sir Robert Walpole was driven from power in February, 1742, and died in 1745, leaving Horace the house in Arlington Street from which so many of his letters are dated. To this he added by purchase, in 1747, the famous villa at Strawberry Hill, Twickenham, commanding a fine view of the Thames and of Richmond Park. He filled it with collections of pictures, books, curiosities, and knick-knacks of all kinds, and in 1757 he established at it a private printing-press. From the Strawberry Hill press he sent forth, among other works, Lord Hubert of Cherbury's curious autobiography; Paul Hentzner's interesting "Travels in England" in the reign of Elizabeth; the Odes of the poet Gray; and his own lively "Anecdotes of Paintings" (1761-71), like his subsequent "Catalogue of Engravers" (1763), based on the papers of Vertue the engraver. In 1758 had appeared his "Catalogue of Royal and Noble Authors," a pleasant and anecdotal work. He essayed a higher flight in 1764, when he published, nominally as a translation from the Italian, the "Castle of Otranto," still read, and a classic in its way—"the first modern attempt," says Sir Walter Scott, "to found a tale of amusing fiction on the basis of the ancient romances of chivalry," and the parent of many similar enterprises. To 1768 belong his tragedy, the "Mysterious Mother," and the better-known "Historic Doubts on the Life and Reign of Richard III.," an ingenious effort towards the "rehabilitation" of one of the monsters of English history. Sipping the foam of society, visiting and visited, gossiping, corresponding, memoir-writing, collecting curiosities, always retaining an eager interest in what was going on, Walpole had reached old age when, in 1791, by the death of his nephew he became Earl of Orford; but he never took his seat in the House of Lords, and rarely used the title. All his unrivalled correspondence is collected in the "Letters of Horace Walpole, edited by Peter Cunningham, now first chronologically arranged" (London, 1857-59). Walpole reveals himself in almost every page of his letters and memoirs as a very clever, witty, polished man of the world, neither amiable nor unamiable, neither virtuous nor vicious, and in whom any capacity for depth of attachment, whether to persons or to principles, is only rarely and fitfully apparent. As a writer his merits and services are



considerable. "No man," says Lord Macaulay, among whose essays is a severe one upon Horace Walpole, "no man who has written so much is so seldom tiresome." The social and much of the biographical and political history of England during his time is photographed in the long series of his inimitable letters.

**WALPOLE, SIR ROBERT**, Earl of Orford, a celebrated English statesman, the third son of Robert Walpole, M.P. for Castle Rising, was born at Houghton, on 26th August, 1676. He was educated at a private school at Massingham, and afterwards on the foundation at Eton, and at King's College, Cambridge. His father died on 28th November, 1700, and as his two elder brothers were dead he inherited the family estate. He immediately entered Parliament as a member for Castle Rising; and joined the Whigs in promoting the Protestant succession. He attracted the attention of the leaders of the party; and in March, 1705, was appointed one of the council to Prince George of Denmark, then lord high admiral. Henceforward he assumed a high position in Parliament, and in 1708, on his promotion to the office of secretary at war, the management of the House of Commons was intrusted to him by his party. In 1710 he was appointed one of the managers for the impeachment of Sacheverel. The Whig administration being shortly afterwards broken up, Harley vainly endeavoured to persuade Walpole to accept a place in the new cabinet, and declared him to be worth half his party. When the ex-ministers were charged with corruption and inaccuracy in the public accounts, their defence was ably conducted by Walpole; but he was punished for his zeal by a similar accusation directed against himself personally. On 17th January, 1712, a majority of the House resolved that while secretary at war he had been "guilty of a high breach of trust and notorious corruption," and he was accordingly committed to the Tower and expelled the House of Commons. His popularity, however, remained undiminished, and he did more for his vindication with his pen while in prison than he could have done in the face of his enemies, who had already condemned him. He remained a prisoner until the prorogation of Parliament, and at the dissolution in August, 1713, again entered the House of Commons as member for Lynn.

He became prime minister in 1721, and held the office uninterruptedly until 1742. To follow him through the events of his long administration would require little less than a history of his times. There were no important debates in Parliament, no deliberations in the cabinet, no negotiations with foreign states in which he did not bear the most conspicuous part as the first statesman of his day.

In 1737 his influence was much shaken, first by the quarrel between the king and the Prince of Wales, and the hostility of the latter to the king's government, and especially to Walpole, who had been chiefly consulted by the king; and, secondly, by the death of Queen Caroline, who had always been one of his strongest supporters. In 1740 a motion was made for an address to the crown for the removal of Sir Robert Walpole "from his Majesty's presence and councils for ever." No distinct charges were made against the minister; but every complaint against the measures of his government, foreign or domestic, during the last twenty years was urged as a reason for his dismissal. Walpole defended himself with boldness and dignity, and the motion was negatived by a large majority in both Houses. But, notwithstanding this triumph, his power was nearly exhausted. A dissolution followed. After several close divisions in the next Parliament he was left, 2nd February, 1742, in a minority of sixteen on an election case. On the 9th he was created Earl of Orford by the king, with a pension of £1000 a year, and on the 11th he resigned.

Walpole was a great minister rather than a great man. His talents were eminently practical, and he had a rare

capacity for the management of public affairs. Imperfectly educated, and in many directions very ill-informed, he yet possessed a thorough knowledge of mankind, of his own countrymen, and above all of the House of Commons. In debate he was admirable, and catching, as it were, by intuition the disposition of the House, knew exactly when to press and when to recede. In the transaction of public affairs he was industrious and methodical, and managed to get through more business than any other public man of his time without ever appearing to be in a hurry. His chief characteristic appears to have been his love of power, but when that was gratified he sought the true interests of his country, which he understood better than any of his contemporaries, and strove to promote prosperity at home and peace abroad. He was not very scrupulous in the means he adopted to maintain his power, and his maxim being that every man had his price, he practised corruption on a large scale; but in this respect there is much excuse for him in the low state of political morality in his age, and as Macaulay observes—"We might as well accuse the poor Lowland farmers who paid blackmail to Rob Roy, of corrupting the virtue of the Highlanders, as accuse Sir Robert Walpole of corrupting the virtue of Parliament."

**WALPURGIS NIGHT**, the night of the festival of St. Walpurga, or Walburga, niece of Boniface, the apostle of Germany, and abbess of the convent of Herdrinheim, founded by her brother, St. Wunnibald, where she died in 778. Her feast-day is properly the 25th of February, but being assigned in some German calendars to the 1st of May, it has accidentally become associated with a popular superstition. Walpurgis Night is therefore the eve of St. Walpurga's day, and the occasion on which the witches repair to their annual festival, held on the summit of the Brocken, the highest point of the Harz, under the direct superintendence of their master, the devil. The Witches' Sabbath, as it is sometimes called, has been described with ghastly force of imagination in the second part of Goethe's "Faust." (See Sir Theodore Martin's, or Mr. A. Hayward's translation; the latter contains some interesting notes.) The legend of the Witches' Sabbath arose from the fact that the heathen ceremony of kindling the sacred May-fire was kept up for centuries in the heart of the mountains by those who secretly adhered to the old faith, and whose dancing lights were set down by the superstitious to the work of demons. Goethe has a fine poem on "The First Walpurgis Night," which Mendelssohn has worthily set to music.

**WALRUS or MORSE** (*Trichechus rosmarus*) is an aquatic mammal, the only representative of the family Trichechidae, a family of the aquatic Carnivora (Pinnipedia), and hence nearly allied to the seals and sea-lions. [See SEAL.] The Walrus is an inhabitant of the northern regions of both hemispheres within the arctic circle. Occasionally it strays further south, and specimens have occurred on the northern coasts of Scotland. The Walrus is a huge bulky animal, the body usually measuring from 10 to 15 feet, and weighing 2000 lbs. or more. The skin is covered with brown soft hairs, and is so tough and thick as to be almost impenetrable by harpoons and even bullets. The head is comparatively small and greatly flattened, terminating anteriorly in an abruptly truncated muzzle, which is tumid at the sides, and clothed with long and very strong bristles. The lips are very thick, and the nostrils are semilunar in shape, and placed high up on the summit of the muzzle. The eyes are small, and there is no external ear. The skull is large and massive, and facially more elongated than in the seals. In both sexes the upper canine teeth are developed into two immense tusks, which are directed downwards, and are continually growing as they wear away at the points; they vary in length from 8 inches to 2 feet, and weigh from 5 to 15 lbs. In the upper jaw there are also two incisors, six premolars,



and four molar teeth; while the lower jaw has no incisors, two small canines, six premolars, and two molars. The incisor and molar series are very similar, being short, cylindrical, and obliquely truncated at their crowns. The limbs are short and strong, terminating in broad five-toed flippers. The hind limbs are connected together by a broad membrane, which conceals the tail.

The walrus is gregarious in its habits, being generally met with in herds, consisting of from a dozen to several hundreds. It feeds on mussels, whelks, cockles, and other molluscs, and also on shrimps, star-fishes, and marine worms; remains of seals, whales, and fishes are also found in its stomach. It is not probable that it feeds, to any great extent at least, on sea-weeds. It has the habit of swallowing stones, with what object is not known. The tusks are used in digging up food, in climbing on the ice, and as offensive weapons. The walrus is monogamous, and the young are zealously protected by the parents, as their tusks are scarcely developed for two years after birth. The greatest enemy of the walrus, next to man, is the polar bear. On land or on the floating ice-fields the movements of this animal are awkward and clumsy, though it is sufficiently active in the water. Except when attacked it is quiet and inoffensive. During the autumn it will pass days or weeks together on land, without tasting food, in a state of lethargy. The walrus is eagerly hunted, as the tusks are superior for ivory to those of the elephant, being of a purer white and of denser texture. It also yields a small quantity of a transparent inodorous oil. The hide was formerly valued for making ropes and cables. The flesh is eaten by the Eskimos, and the tongue is considered a dainty by whalers and arctic explorers. The young are capable of domestication, and display considerable intelligence. See Plate.

**WALSALL**, a market-town and municipal and parliamentary borough of England, in the county of Stafford, 8 miles N.N.W. from Birmingham, and 123 north-west of London by the North-western Railway, is situated on the declivity and summit of a low hill, near the source of the Tame, at the eastern border of the South Staffordshire coal-field and iron district. There are also freestone and limestone quarries in the neighbourhood. The town is regularly laid out and well built, the public edifices being unusually handsome. It contains a town-hall, guildhall, agricultural hall, temperance hall, cottage hospital, theatre, parish church, with a handsome tower and lofty spire; several other churches and places of worship for dissenters. There are also a free grammar-school, in which Lord Somers was educated; blue-coat schools, and a public library, of good design. The town stands amid pleasing scenery, and the environs are adorned with many handsome villas. A well-laid-out arboretum, covering an area of 18 acres, with a large lake  $7\frac{1}{2}$  acres in extent, was opened in 1874. A statue in memory of "Sister Dora," whose labours were in the hospital in this town, was erected in the market-place in 1886, being the first statue ever erected in England to a female other than a member of the royal family. The trade of the place is immense, and includes every branch of iron manufacture, but chiefly saddler's ironmongery. There are also several considerable brass foundries, and leather manufactories in connection with the saddlery and harness trade, in which branch of industry the town probably does more than all the rest of England together. Besides supplying the home markets, large quantities are exported to Australia, Canada, and South America. Spectacle frames, small steel goods of various kinds, and iron bedsteads are also made, and silver and brass plating furnish employment to a very large number of hands. Walsall also contains some extensive malting establishments. The municipal borough is divided into three wards, and is governed by six aldermen (of whom one is mayor) and eighteen councillors. The population of the municipal borough in 1881 was 58,795. The

parliamentary borough, which returns one member, has a population of 59,402. Walsall, formerly called *Wealdesburg* and *Weddsborow*, stands in the midst of a forest, where, in ancient times, the Druids are supposed to have celebrated their religious rites. The town, originally fortified by Ethelfleda, queen of Mercia, was, at the date of the Conquest, royal property, but it afterwards came into possession of the Dukes of Northumberland, and was held by them till the attainder of the duke in the reign of Queen Mary.

**WALSINGHAM** or **WALSINGHAM, SIR FRANCIS**, a secretary of state in the reign of Queen Elizabeth, and a celebrated master of the statecraft of that period, was born of an ancient Norfolk family, of which a younger branch had settled in Kent, at Chislehurst, in 1536. He was educated at King's College, Cambridge, and being a staunch Protestant he passed the years of Mary's reign upon the Continent, where he acquired a knowledge of languages which made him one of the first linguists of his time. Returning to England he found favour with Cecil, and displaying great powers as a negotiator and observer, he was sent in 1570 on a mission to France, in which he was so successful that on his return he was knighted, appointed one of the principal secretaries of state, and sworn a member of the Privy Council. He was driven home by the massacre of St. Bartholomew, but he continued his assiduous service to the state, and in 1578 he was a commissioner for the settlement of the Netherlands. The same year he was appointed chancellor of the Order of the Garter, his first duties on entering the office being to regulate the proceedings for the election and installation of three sovereigns—the Emperor of Germany, the King of France, and the King of Denmark. In 1581 he was again sent to Paris on an important mission, and in 1583 he proceeded to Scotland, where he is said "to have altered the government as ambassador." In 1586 his skill in counterplotting and entrapping conspirators was displayed in his management of the Babington conspiracy in favour of Mary Stuart. By suffering the scheme to come to a head, by intercepting, deciphering, and then forwarding the letters to that unfortunate queen, he succeeded in involving Mary so that her death could be compassed within the limits of the law. He was one of the commissioners for the trial of Mary, and for his services was rewarded with the chancellorship of the duchy of Lancaster. He died 6th April, 1590, leaving one surviving daughter, who was successively the wife of Sir Philip Sidney, Robert Devereux, earl of Essex, and Richard de Burgh, earl of Clanricarde.

Walsingham was justly valued by the ministers of Elizabeth for his astuteness and profound dissimulation. It was a time when plotting and underhand working were relied upon as part of the regular machinery of state affairs, and in work of this kind he was pre-eminently skilful. One of his biographers exultingly states that "in foreign countries he had fifty-three agents and eighteen spies"—a somewhat dubious distinction—and that among the enemies of his country he could "sow seeds of division, as the fiend in the gospel sows." At the same time it must be remembered to his honour, that he was unswervingly faithful to his queen, his country, and the cause of Protestantism, a man of spotless integrity in all personal matters, and so devoted to his official duties that at the end of his career he had to direct in his will that his estates should be sold to pay the debts he had incurred in the public service. The history of his French mission was published in 1655 by Sir Dudley Digges, under the title of "The Compleat Ambassador." See also Froude's "History of England" (vols. vii.—xii.)

**WALTHAM**, a town of Massachusetts, in the United States, situated on the Charles River, 10 miles north-west

of Boston. It has the usual religious and educational buildings, and extensive cotton mills, but is chiefly famous for its great watch factory.

**WALTHAM ABBEY** or **HOLY CROSS**, a small town of England, in the county of Essex, situated on the Lea,  $11\frac{1}{2}$  miles north-east of London. There are extensive gunpowder mills belonging to the government, and near it the Enfield Small-arms Factory. In its fine old church are reported to be interred the remains of Harold and his two brothers, killed at the battle of Hastings. The population in 1881 was 5368. Queen Eleanor's Cross at Waltham is said to have been designed by Pietro Cavallini, a Roman sculptor, painter, architect, and the founder of modern mosaic. It was commenced in 1291 and completed in 1294, the work having been executed by Alexander of Abingdon, Dominic Leyer of Reims, and Roger of Crundale. The three beautiful statues of Queen Eleanor standing under the canopies are, however, the work of William de Ireland, and are considered lifelike. The stone was brought from Caen, in Normandy. It was erected by order of King Edward I. in memory of his consort, Queen Eleanor, daughter of Ferdinand III., king of Castile and Leon, whose arms are cut at the lower part of the cross, as are those of the Countess of Ponthieu, her mother, and those of England. The cross was carefully restored in 1887.

**WALTON-ON-THAMES**, a large village of England, in the county of Surrey, 17 miles south-west of London, on the South-western Railway, spreads along the low level bank of the Thames, which is here crossed by a bridge. The river at this point is very beautiful. At Cowey Stakes, below the bridge, Caesar is supposed to have crossed the Thames in pursuit of Cassivelaunus ("Comm. de Bell. Gall." lib. v.) The church is partly transitional Norman in style, and contains some brasses and a memorial to William Lilly the astrologer, and the "Sidrophel" of Butler's "Hudibras." Dr. Maginn is buried in the churchyard. Admiral Lord Rodney was born at Walton in 1708. The population of the parish in 1881 was 6572.

**WALTON, IZAAK**, the well-known author of "The Complete Angler" and patron saint of the piscatorial art, was born at Stafford in 1593, and on the 9th of August. Nothing certain is known of his early life, but in 1624 we find him established in Fleet Street, London, as a hosier, having previously removed from a small tenement in the Royal Exchange. In 1643, having acquired a moderate competency, Walton retired from business, and thenceforth wholly abandoned himself to those literary and piscatorial pursuits in which his soul delighted. He had already made frequent fishing excursions, with congenial companions, to the little River Lea, whose waters now offer but few temptations to the angler; and had adventured into print as early as 1640, with a "Life of Dr. John Donne," the poet and divine, of whom he had been the friend, the disciple, and the admirer. In 1646 he married a sister of Bishop Ken, the author of the "Evening Hymn." Walton died in 1683, in his ninety-first year, while on a visit to his daughter Anne, at Winchester, where, in the stately cathedral, he lies buried.

The work by which he is chiefly known is "The Complete Angler, or Contemplative Man's Recreation," which was first published in 1653, and passed through five editions in its author's lifetime. Its popularity has been preserved undiminished up to the present time, when it is read and loved, not certainly on account of its precepts and practical directions, which are now obsolete, but for its charming style, its vivid sketches of nature, its genial wisdom, and devout piety.

A monument to Walton was placed in St. Mary's, Stafford, the church of his baptism, in 1878. His biography has been written by Hawkins, Sir N. H. Nicholas, and W. Dowling, the best being that by Nicholas. A fac-simile

reprint of the rare first edition of "The Complete Angler" was published by Elliot Stock in London in 1876.

**WALTZ** (Ger. *Wälzer*, i.e. a roller), the name of the German national dance, and also of the characteristic music, in triple time, by which it is accompanied; its native home appears to be Bohemia. It was introduced into England by Baron Neumann and others, about 1813, not without much opposition on the ground of its alleged indelicacy. It provoked a satire from the pen of Byron, entitled "The Waltz, an Apostrophic Hymn," but the satire was wholly unworthy of the poet's genius. Of late years a more rapid waltz step has been introduced, entitled the *Valse à deux Temps*. Every season sees some variation in the style of waltzing, and the dance is so popular that it almost monopolizes ball programmes.

Much beautiful music to the waltz has been written, from the classical tunes of Beethoven and Schubert to the irresistible rhythms of Strauss, Waldeuffel, and Gungl. The tempo of the waltz has been used by Chopin, Brahms, and Rubinstein (and twice by Gounod in "Faust") for compositions of the highest order, both instrumental and vocal.

**WALWORTH, SIR WILLIAM**, who slew Wat Tyler, belonged to the Fishmongers' Company, and was for the first time lord mayor of London in 1375, when he distinguished himself by an attempt to suppress or diminish usury. He was a second time lord mayor in 1381, when the insurrection of Wat Tyler broke out. He was with the king in West Smithfield, on the 15th of June, 1381, when Richard II. parleyed with the rebel. According to one account, while Wat Tyler was explaining his demands to his sovereign, he now and then lifted up his sword threateningly, until at last Walworth could forbear no longer, but with sword or mace struck him dead. As a reward the king knighted him, and bestowed on him £100 a year. The city arms received the addition of a dagger to commemorate the occurrence. In the year of this achievement Sir William Walworth founded a college in the old church of St. Michael's, Crooked Lane, and was buried there on his death in 1385.

**WAMPUM**, the common English name for the shell beads used for ornament and as currency among the northern, Algonquin, and Iroquois tribes of American Indians. They were made chiefly on Long Island and around New York Bay. There were two kinds—wampum or wampumpeag, which was white and was made from the conch or periwinkle; and the suckanhook, black or rather purple, made from the hard shell clam, and worth twice as much as the white. The shell was broken in pieces, rubbed smooth on a stone till about the thickness of a pipe stem, then cut and pierced with a drill. It was then strung or made into belts. As money and for dealings with the Indians its use passed to the New England, French, and Dutch settlers, being known in French as *porcelaine* and in Dutch as *zewant*. By the Indians it was used for earrings, necklaces, bracelets, and belts, and belts made from it were given or exchanged in all treaties and public engagements.

**WANDERING JEW, THE.** See **JEW, THE WANDERING.**

**WANDEROO'** is the name given to several species of monkeys. It is the Cingalese word for monkey Anglicized. The species commonly known as the Wanderoo is *Macacus silenus*, a species of **MACAQUE**, which is, however, not a native of Ceylon, but of Southern India, especially of the Malabar coast; it has only been introduced into Ceylon. It has a slim body, covered with deep black hair, less than 2 feet in length, exclusive of the tail, which measures 10 or 12 inches more, and is tufted at the extremity. The head is surrounded by a long thick mane or ruff of grayish hairs, which unites below the chin, and gives this monkey a peculiar appearance of wisdom and importance. Whether

on this account, or because of its physical superiority, its fellow-monkeys on the Malabar coast are said to pay it the greatest reverence. It is easily trained to perform a variety of tricks, but it does not appear to be superior in intelligence to others of its tribe.

The name Wanderoo is also given to several monkeys of the genus *SEMNOPITHECUS* found in Ceylon.

**WANES, THE**, a race of gods or divine beings occupying much the same position in the Norse mythology as that taken by the Titans in the classical myths; that is to say, a race almost equal in power to the supreme gods, and from whom the sovereignty of heaven could only be wrested after severe conflict. In the Edda the Wanæs attack Asgard, the home of the Ases (gods), arriving with unnumbered followers from Wanaheim. Both sides being immortal, the pain of repeated wounds, which healed after each conflict, had to be borne, and the air was thick with hurtling spears. Weary of the useless spear-conflict the rocks were torn from the mountains, trees pulled up by their roots, and with these missiles the rival races attempted to crush each other. Then slowly gathered the Jotuns (giants), laughing low, and preparing to fall on Ases and Wanæs alike, as soon as their strength was wasted. Therefore Father Wotan swung his spear for a truce, and his wise counsels quickly prevailed. The Ases gave to the Wanæs the brother of Wotan for a hostage, with the wise Mimir also, but the Wanæs cut off the head of Mimir and sent it back in derision. Then Father Wotan restored it to life with magic runes, and used it as an oracle. The Ases also received hostages from the Wanæs; these were Niödr and his children Frey and Freya. But their treatment of their hostages was not like that of their foes. Niödr and his children were welcomed as equals, and soon no difference was perceptible between them and the Ases by birth.

This conflict with the Wanæs, and the Wanic origin of three important divinities of Asgard, are held to betoken a great prehistoric war of races, in which (as with the Romans and Sabines) a ground of peace was found by the vanquished party retaining some of its chief gods while accepting in the main the religious system of its conquerors. The Wanæs are generally spoken of as the "wise Wanæs," and the three who became Ases by adoption were the special gods of the Suevi and other maritime tribes, and were everywhere held in great honour.

**WAN'LOCKHEAD**, a village of Scotland, in the county and 25 miles N.N.W. of Dumfries, in a rich mining district, where, within a circle of less than 3 miles occur the principal deposits of lead in Scotland. The mines are in Silurian slates, and are wrought as deep as 136 fathoms. The vein-stones are chiefly calc-spar, heavy spar, and quartz, with which, besides the galena or common ore, are associated many varieties, as the phosphate, arseniate, vanadate, sulphate, carbonate, and other minerals. The elevation is 1380 feet. There are a parish church and a Free church, and the population of the village in 1881 was 788.

**WAN'TAGE**, a market-town of England, in the county of Berks, 60½ miles from London by the Great Western Railway. It was a place of importance in Saxon times, and the birthplace of Alfred the Great. On 25th October, 1849, a gathering from all parts of the kingdom took place in the town to commemorate the thousandth anniversary of the event, and in 1877 a handsome marble statue of the king was unveiled by the Prince of Wales. The figure is 9 feet high, and is based on a massive plinth 8 feet in height. The town was also the native place of Bishop Butler. The parish church of St. Peter and St. Paul is in the form of a cross; it contains several ancient tombs and monumental brasses. The St. Mary's Home for Penitents is a Magdalen institution, conducted by resident Sisters of Mercy in connection with the church. There are also a training school for village schoolmistresses,

and several other good schools. There are places of worship for dissenters, and a free grammar-school. There are also some almshouses. Wantage has an ancient market cross, and a town-hall. A branch of the Wilts and Berks Canal comes up to the town, which trades in corn, flour, and malt, and has manufactures of agricultural implements, and it was the first town in England to possess a steam tramway. Altogether it is a busy and prosperous place, and the corn market is famous as that of the rich district of the Vale of White Horse. A corn exchange was erected opposite the town-hall in 1865. The population of the parish in 1881 was 4378; of the town, 3488.

**WAP'ENTAKE** (*wapfin*, weapons), that is, a district supplying a certain levy to the army; the equivalent division of the northern and central shires of England (York, Derby, Leicester, &c.) to the Hundred of the southern shires. Probably both meant the same thing, and the hundred or wapentake maintained a hundred warriors.

**WAP'ITI** (*Cervus canadensis*) is a species of DEER (Cervidae), a native of North America. It is very similar to the Stag or Red Deer of Europe (*Cervus elaphus*), but exceeds the latter in size, standing about 4½ feet high at the shoulders. It is of a general reddish-brown colour, with a patch of light-coloured hairs on the rump, bordered on either side by a blackish streak. The neck of the male is covered with long coarse black hairs. The antlers are very large and spreading, measuring 4 or 5 feet in their widest spread, and weighing from 20 to 30 pounds. The wapiti is found chiefly in the woodlands of Canada and the United States, extending as far south as Carolina. It feeds chiefly on the leaves of trees and shrubs. It is gregarious in its habits. It utters a peculiar shrill cry, and is said to be a stupid creature. In some parts of America it is called the elk, though that name more properly belongs to the Moose (*Alces americanus*). It is commonly hunted, but chiefly for the skin, as the venison is said to be rather coarse.

**WAR VESSELS.** To the people of Great Britain the subject of fighting ships is one of the greatest interest and importance. Not only is it associated with the names and deeds of those seamen who have made the British Empire what it is, by carrying its victorious flag around the world, planting colonies and extending commerce in all directions, but the safety, indeed the very existence, of the nation is dependent on its ships. They are not only its chief defence against foreign invasion, but the means, through keeping open the communication by sea, by which the dense population of these islands are able to obtain the greater part of their daily bread.

Under the article NAVY we have sketched the early history of our naval forces. We have here to deal chiefly with the remarkable revolution, or series of revolutions, that have affected the construction and armament of fighting ships in modern times. In Plate I. we have represented three models of ancient "men-of-war," built at intervals of about 100 years—the *Great Harry*, the first vessel of the royal navy, 1514, the *Royal William*, built 1670, and a 64-gun ship, built in 1760—from which it will be seen that the variation of type was very small, and that only improvements in minor details were attempted. In those days ships' guns were worked entirely by hand, they used solid projectiles, and it was an accepted principle that the offensive power of any ship was measured by the *weight of metal* which could be thrown from her artillery in a given time. To increase the available number of guns, the freeboard of the vessels was increased to the utmost, until three gun-decks were available for action in moderate weather. In the time of Nelson a further improvement was effected by the introduction of the *carronade*, a short gun of moderate weight and relatively large calibre, which could be rapidly loaded, run out, and discharged, and was

very effective at close quarters, but of course limited in its range. With such vessels and guns were the great naval victories of Nelson achieved, and so satisfied were Englishmen with these results, that great reluctance was felt to depart from a type associated with such brilliant success. It fell, in consequence, to a French artillery officer, H. J. Paixhans, to suggest the first of the improvements that have revolutionized naval warfare.

During the early wars of the French Republic attempts had been made to fire shells from mortars on board ship, but with so little success that the material was finally thrown overboard. Paixhans proposed, in a work published in 1822, by enlarging somewhat the bore of the ordinary cannon, to adapt it for throwing an explosive projectile, at first spherical in shape. He pointed out with such clearness the very destructive effects of such projectiles on the wooden warships then in use, that within two years the French government armed their fleet with the new "shell-guns," as they were called, and the British Admiralty was compelled to follow their example. An opportunity of practically testing this invention on a large scale did not, however, occur until 1853. In that year the Turkish fleet in the port of Sinope was completely destroyed in a few hours by the Russian vessels armed with shell-guns, while they themselves suffered no serious injury from the solid shot of the enemy. This event alone was sufficient to show that the days of wooden fleets were over, and it was confirmed by the subsequent experiences of British vessels under the shell-fire of Russian forts.

Again it was left to the French engineers to combat the new weapon their countryman had produced. Steam had by that time been introduced as a means of propulsion for ships of war, and in 1854 a number of "floating batteries," propelled by steam and armoured with 4-inch iron plates, were constructed in France and took part in the following year, with striking success, in the bombardment of Kinburn. Similar vessels were built in England, but were completed too late to take part in this action. This success was conclusive as to the value of armour-plating, but those batteries were not intended as sea-going vessels, having neither the necessary speed nor seaworthiness. In 1858, however, the French naval architect Dupuy de Lôme commenced the conversion of the war steamship *Napoleon III.* into the first sea-going ironclad frigate *La Gloire*, and she was launched 24th November, 1859. The attention of the British government had been drawn to the great risk run by the fleet if a foreign country were allowed to monopolize ironclad vessels, and some months before the completion of *La Gloire* the *Warrior* was ordered to be built on the Clyde. She was (unlike *La Gloire*) built entirely of iron, steamed over fourteen knots an hour, and was protected for two-thirds of her length with armour-plating 4½ inches thick, which no gun then afloat could pierce, and her stem was so constructed as to be used for ramming if necessary. She was completed in October, 1861, and the *Black Prince*, from the same design, in September, 1862. Thus was commenced the era of ironclad construction, which developed before long into a duel between the naval architect and the constructor of heavy artillery.

But fresh experience was destined to be gained, and a new type in naval architecture was evolved, during the Civil War in America, which broke out at this time. When this war commenced the United States navy consisted of the usual type of wooden vessels, and the officers of the Confederate States were the first to recognize the advantage that the introduction of armour might put into their hands. A war steamer had been scuttled in the harbour of Norfolk to prevent her falling into their hands. She was successfully raised, cut down nearly to the water's edge, and covered with an iron deck and an armoured citadel with sloping sides, and armed with heavy rifled guns. The *Merrimac*, as she was named, was unrigged and propelled

by steam. She was well advanced before the Federal government recognized the danger that menaced them. They then had recourse to the well-known engineer Ericsson of New York, who had proposed the use of armoured vessels to Napoleon III., and he undertook within the time at disposal (100 days) to construct a vessel capable of meeting the *Merrimac*. This vessel was necessarily, from the limitation of time, of small size, 172 feet long by 41 broad at the water-line. Her hull was almost entirely submerged, but heavily armoured at the water-line, and in the centre of her armoured deck rose a cylindrical tower, 9 feet high, also heavily armoured, capable of rotation on its vertical axis, and carrying two heavy guns. The *Merrimac* reached Hampton Roads, where the United States fleet lay, on 8th March, 1862, and, herself unharmed, destroyed two of these vessels, the *Cumberland* and *Congress*. Next morning the *Monitor*, as Ericsson's vessel was named, appeared on the scene. The duel between the two ironclads was a long one, as they were almost unable to harm each other, but the *Merrimac* finally beat a retreat and the Federal fleet was saved. A fleet of vessels of the *Monitor* type was at once commenced by the Federal government. Most of these ships had two turrets, and they proved most efficient fighting ships in rivers and smooth water, but bad and even dangerous sea-boats, from their low freeboard and consequent lack of reserve buoyancy. The original *Monitor* was lost at sea not long after her first brilliant success.

The attention of foreign governments, and especially that of England, was at once directed to this new type of vessel. Captain Cowper Coles in England had for some time advocated the adoption of such vessels, and after some experiments in adapting existing vessels to this purpose, it was decided to build a sea-going monitor called the *Monarch*, based on Captain Coles system, but modified to secure increased safety. Her length was 330 feet, displacement 8322 tons, and she had 14 feet freeboard and 10-inch to 8-inch armour. Her performances were highly satisfactory for the time, but Captain Coles was dissatisfied with her as representing his ideas, and the admiralty agreed to the construction of another ship (the *Captain*), under his personal supervision, of a displacement of 7900 tons. Owing, however, to her small freeboard (only 6 feet), she proved to have insufficient stability, and capsized in a storm in the Bay of Biscay, going down with her designer himself on board. This mishap has caused special attention to be paid to the stability of subsequent vessels of the turret or monitor type.

Meantime the contest between the powers of marine artillery and the resistance of armour was actively proceeding, with two remarkable results. From the first it had not been considered practicable to defend a vessel with armour much under, as well as above, the water-line. The unprotected bottom of the vessel therefore became the object of a new mode of attack by means of the torpedo or mine, which received considerable development during the American Civil War. At first it was moored in a fixed position and exploded by contact or by electricity, but latterly it has been rendered capable of locomotion (as described in the article TORPEDO), and has thus become a veritable submarine projectile directed against the unprotected parts of ships.

At the same time the successive improvements in the construction of guns, and in the gunpowder which was used in them [see GUN and GUNNERY], had caused a gradual increase in the thickness of the armour required to withstand modern projectiles, from the original thickness of 4½ inches to, in some cases, 24 inches. But to protect an entire vessel with armour of this thickness was obviously impossible without a total sacrifice of her most valuable qualities. It therefore became necessary in modern vessels to restrict the armour, or at least the

thickest armour, to the vital parts of the ship, containing her engines and boilers, magazines, and heavy guns. The rest of the hull had to rely chiefly on a system of subdivision into watertight compartments, and partly on a shell-proof deck placed under the water-line. In some vessels of a recent date this principle has been carried further still, to the extent of wholly abandoning armour protection for the hull, and depending for safety on cellular construction and on the great speed which this lightening of the vessel, combined with powerful engines, enables her to attain. This last development of naval construction has taken place, however, not in the British, but in the Italian navy, and its wisdom has still to be proved.

As with armour, so with guns, their ever-increasing power and weight have greatly reduced the number which can be carried by a first-rate ship-of-war. In place of the broadside battery of the early ironclads, a central battery has been substituted in some vessels. The most powerful example of this type in the British navy is the *Alexandra* (fig. 1, Plate II.) She carries ten guns of 18 tons and two of 25 tons, and of these she can fire four straight ahead and two straight astern. On each broadside from four to six guns can be used. She is protected along the entire water-line with 10-inch armour, increasing to 12 inches in the centre, and reduced to 8 inches on the battery. She is fitted with twin-screws, driven by two independent compound engines of 4000 horse-power each, completely separated by a longitudinal bulkhead, so that should one be injured the other could still be worked. At the official trial the speed attained was 15 knots.

In the newest and most powerful vessels of the French navy a type has been adopted which may be described as coming half-way between the central battery and the turret system. We give an engraving (Plate II.) of the *Amiral Duperré* as an example of this class. She is protected along the entire water-line by a belt of armour 13 feet 8 inches in height, and having a maximum thickness of 21·6 inches. The battery between decks, which is entirely unprotected, carries fourteen breechloading 60-pounders, but on the upper deck are placed four immovable open-topped turrets or towers, armoured with 12-inch plates, and on each is mounted a 48-ton breechloading gun, firing *en barbette* over the parapet of the tower. A light flying deck or bridge protects the interior of the towers from machine-gun fire, but they have little other protection except that afforded by their great height above the sea-level (27 feet 5 inches). Two turrets are placed forward, one on each bow, with the armoured conning-tower between them, one amidships, and one behind the mizen-mast. The ship is full-rigged, and it is claimed that the elevation of her guns above the water, and the great range of fire obtained by the barbette system, compensate for the exposure of the gun crews.

Several other vessels recently built for the French navy are of the same type, but no ship of the Monitor or closed-turret type has yet been constructed by France. The most formidable completed vessel of this type in the British navy is the *Inflexible* (Plate III. fig. 1). The armour-plating in this ship is confined to the central part or "citadel," 110 feet long and rising 10 feet above the water-line and 75 feet in breadth. On the diagonal corners of this structure (which incloses the engines and boilers, magazines, and hydraulic gear for loading the guns and moving the turrets) stand the two closed revolving turrets, each containing two 81-ton guns. As will be seen from the engraving, all four guns can be fired ahead, astern, or towards any point of the compass. The vessel is rigged for cruising purposes, but in the event of war her masts would be removed, and she would depend on her steam-power alone. The "citadel" is protected with compound armour, 24 inches thick, and the turret with steel-faced armour 16 inches in thickness, while the submerged part of the hull is

covered with an armoured deck 3 inches thick, under the water-line, and the whole vessel is divided into 135 watertight compartments, many of which are filled with cork to secure a certain buoyancy even if pierced by shot, which, with the double bottom, is regarded as a valuable provision against torpedo attack as well as artillery. She is driven by means of two sets of engines of 8000 horse-power, at a speed of 14·75 knots, which was considered a high speed for so broad and heavy a vessel. Besides the heavy guns in the turrets she is armed with apparatus for discharging the Whitehead torpedo both above and below water by compressed air, and is likewise furnished with light shell-guns and machine guns, besides her powerful ram.

The only completed ironclads of the Monitor type comparable with the *Inflexible* are the large vessels *Dandolo* and *Duilio* of the Italian navy. The latter (represented in fig. 1, Plate IV.) is a vessel of 10,401 tons (the *Inflexible* being of 11,880). She is 340 feet 11 inches in length, 64 feet 9 inches in beam, and is protected by armour 21½ inches thick on the central citadel, and 17·71 inches in solid plates, manufactured at Sheffield, on the two turrets, which are placed diagonally on an armoured citadel 107 feet by 58 feet, and each carry two 100-ton Armstrong guns, manufactured at Elswick. The turrets being placed nearer the centre line of the ship than in the broader *Inflexible*, only three guns can be fired directly ahead and two astern. She has engines of 7700 horse-power, calculated to drive her at the rate of about 15 knots by means of twin screws. She is provided with an armoured deck under water, and is divided longitudinally and transversely into 102 watertight compartments. The height of her heavy guns above the water is 15 feet 9 inches, which is slightly greater than in the *Inflexible*.

The largest ironclads of the Monitor type yet designed for the British navy are the *Trafalgar* and the *Nile*, the former of which was launched in September, 1887, but is not expected to be ready for sea until 1890. The displacement of this great vessel (fig. 3, Plate III.) is 11,940 tons, her length 345 feet, and breadth 73 feet. She is protected by a much longer belt of armour on the water-line than the *Inflexible*, extending to 230 feet, and before and behind this belt extends a steel deck 3 inches thick. The armour on the belt is 20 inches thick, on the sides of the citadel 16 to 18 inches, and on the turret 18 inches. There is also an inner skin of 2 inches behind the teak backing. The central citadel is 193 feet long, and carries two turrets armed with two 68-ton breechloading guns each. Between the turrets is a central box-battery with armour 5 inches thick, containing eight 5-inch breechloading guns, and on the upper deck a number of machine guns well mounted. The ship will have, in addition, a powerful torpedo armament, and will of course be fitted for ramming. The engines are to be of the triple expansion type, of 12,000 horse-power, calculated to drive the vessel at a speed of 16½ knots.

These vessels, when completed, are expected to be equal, if not superior, to the most powerful vessels of the French or Italian navies.

A new type has been lately introduced into the British navy in the "admiral" class of vessels, with fixed barbette towers instead of movable turrets, and a broadside armament of light guns. The *Collingwood* (fig. 2, Plate III.) may be taken as an example of these warships, which differ from the French type in being unrigged, and armoured only on their central citadel and the towers. In the *Collingwood*, which is 325 feet long by 68 feet, and of 9150 tons displacement, the side armour is 18 inches thick in centre, and 16 inches at ends, 6 inches on the transverse bulkhead, and 14 to 12 inches on the two barbette towers, each of which carries two breechloading guns of 48 tons, while there are six 6-inch guns on the upper deck, unpro-

teeted by armour. She has the usual armoured deck under water, and cellular construction. The height above water of her upper deck is 10 feet 6 inches, and of the barbette towers, 19 to 20 feet, or about 4 feet and 7 feet respectively less than in the French type of barbette ship.

It will be seen that in these vessels side armour has been dispensed with to a much greater extent than in the French type. The Italians, however, in their most recent barbette ships, the *Italia* (Plate IV., fig. 2) and *Lepanto*, have abandoned such armour altogether, and depended on subdivision and cork-filled chambers and an armoured deck under water for the safety of the ship. The great guns, four 100-ton Armstrong breechloaders, are placed in a central tower or battery, with semicircular ends, extending diagonally across the ship, so that all four guns can be fired forward or aft, and protected by 21-inch armour-plating. The passage by which ammunition is supplied to the guns is also armoured. The length of the ship is 400 feet 6 inches, and the breadth 72 feet 9 inches at water-line. The height of the heavy guns above the water is 32 feet 8 inches, and of the six-inch guns carried on the battery deck 14 feet. These guns, of which six are carried on the upper deck and twelve on the battery deck, as well as every part of the ship (except the casemates) above the armoured deck, are quite unprotected by armour. The vessel is driven by four very powerful engines and twin screws, at a maximum speed of 16 knots. It is expected that her powerful armament would enable her to inflict fatal injury on any single assailant, and that in case of attack by torpedo boats her great speed would prove her best protection. The spaces above the armoured deck are stowed, as far as possible, with coal and other stores, which would serve partially to exclude any water that might enter through shot-holes.

Such vessels may be the precursors of a new description of fighting ship, and certainly for cruising purposes and service on distant seas they offer great advantages, but it is doubtful whether as first-class ships-of-war they are not at a disadvantage compared with those wholly or partly protected with armour. It has been said that the general introduction of the torpedo tends to reduce armoured and unarmoured vessels nearly to an equality. The boats specially built for the use of this weapon have been already described under TORPEDO, but it has yet to be proved that it is as effective for attack in the open sea as it certainly is for the defence of harbours, &c., when assisted by land batteries. As offering the most effective means of defence for the naval depots and coaling stations, on the retention of which the ability of our steam fleet to keep the sea now absolutely depends, there can be no doubt that the torpedo is destined to be of the utmost importance to the British navy.

**WAR, HUNDRED YEARS'.** See HUNDRED YEARS' WAR.

**WAR, THIRTY YEARS'.** See THIRTY YEARS' WAR.

**WARBECK, PERKIN.** See HENRY VII.

**WARBLER** is the popular name given to the birds of the family SYLVIIDÆ. The Wood Warbler (*Sylvia sylvicola*), which is generally distributed in England, usually makes its appearance in this country about the end of April, and takes up its abode in woods and plantations. Its food consists of insects and their larvae. This bird builds a domed nest upon the ground among the herbage, forming it of dry grass, leaves, and moss, and lining it with the grass and hair, but with no feathers. The eggs are six in number, white, spotted all over with deep red and ash colour. It is olive-green above, tinged with yellow, with the wings brown, and the lower part yellow and white.

The Willow Warbler (*Sylvia trochilus*), another British species, arrives in this country about the middle of April, and is most abundant in the south of England. It is common about woods, plantations, and hedges, and makes its

nest upon the ground much in the same way as the preceding species, but lines it with feathers. It is of a dull olive-green above, with the wings and tail-feathers dark brown, and the lower parts whitish.

The Dartford Warbler (*Melizophilus undatus*) has received its name from having been first discovered in the neighbourhood of Dartford in Kent. It is common in Southern Europe, and is a permanent resident in the south of England, though rather a local species. Furze-covered commons are its favourite haunts, hence it is called in some places the *Furzeling* or *Furze Wren*.

The Reed Warbler (*Salicaria arundinacea*) is found during summer in the south of England, frequenting the reeds and osiers that fringe rivers and lakes. The nest is attached by its sides to three or four strong reeds, and is composed of grasses and reeds woven together with a little wool; it is of an elongated conical shape. The reed warbler is of a uniform pale brown above, with the chin and throat white, and the under parts pale buff. It feeds on worms, slugs, and insects. The Sedge Warbler (*Salicaria phragmitis*) is found in the same situations as the preceding species, but is more common. The upper surface exhibits various shades of brown; the under surface is buff colour, with the chin and throat white. There are several other less common British species to which the name warbler is given.

**WARBURTON, WILLIAM**, an eminent English divine, was born at Newark, 24th December, 1698. He was Dean of Bristol from 1757 to 1760, and Bishop of Gloucester from the latter year to his death in 1779. He was the author of numerous works, chiefly controversial; but that by which he is chiefly remembered is "The Divine Legation of Moses" (1738-43), in which, "on the principles of a religious deist," he demonstrated the divine legation "from the omission of the doctrine of a future state of reward and punishment in the Jewish dispensation." The publication of this work led to much adverse criticism, to which the writer replied with great vigour. A further and concluding portion of the work was published after his death. A "Life of Bishop Warburton," by the Rev. John Selby Watson, was published in London in 1863.

**WARD, ARTEMUS**, a distinguished American humorist, whose real name was Charles Farrer Browne, was born at Waterford, Maine, in 1834. His father, who was a storekeeper and farmer, died when his son was thirteen years old. At first a printer's apprentice Browne early obtained work on newspapers, and wrote many of his best sketches for the *Plaindealer*, a Cleveland journal. But it was not till he took to lecturing in 1861 that he made any reputation. His lectures were successful, and were followed by the publication, in 1862, of "Artemus Ward, his Book," a series of sketches. The name of "Artemus Ward" he had borrowed from an eccentric old showman of Cleveland. In 1866 he visited England, where his success was far greater than in America, the peculiarities of his humour being more novel in Great Britain than in the United States. He had become a regular contributor to *Punch*, and a brilliant career seemed assured, when he died of consumption, at Southampton, in 1867. Like all humorists who deal with local peculiarities rather than with the broad facts of life, Ward cannot be considered to have secured a very durable fame; but his humour is nevertheless delightful, and will not soon lose its hold on popular favour. A volume, which is wrongly described as "The Complete Works of Artemus Ward," gives us many of his best sketches, including "Artemus Ward, his Book," "Artemus Ward, his Travels," and "Artemus Ward in London."

**WARD, EDWARD MATTHEW, R.A.** (1816-79), one of the few historical painters among the English school, was educated for art in the schools of the Royal Academy,



and in 1836 went to Rome for a three years' course of study. He became A.R.A. in 1846, and R.A. in 1855. His frescos in the lobby of the House of Commons are most unfortunately not his best pictures. Among his favourite works is the well-known "Johnson in Lord Chesterfield's ante-chamber." His three pictures in the National Gallery represent him at his best, which is indeed an excellent style, if wanting in the elements of the highest genius. These are the "Disgrace of Lord Clarendon," the "South Sea Bubble," and "James II. receiving the news of the landing of the Prince of Orange." The last is an especially fine work. Mrs. Ward, his wife, a daughter of James Ward, R.A., was also an artist of considerable merit.

**WARD, JAMES, R.A.**, the celebrated animal painter, was born in London in 1769, commenced his career as a mezzotinto engraver (having served his time with his brother, William Ward, A.E.), and acquired considerable distinction in that art. He, however, early took to painting, imitating at first the style of his brother-in-law, George Morland. Ward was elected an academician in 1811, and continued to exhibit at the Royal Academy until 1855, acquiring a great reputation for his pictures of horses and cattle. His masterpiece, the admirable large picture of an Alderney bull, cow, and calf, painted in 1822 in emulation of Paul Potter, and now in the National Gallery, was exhibited at the British Institution in 1821. He died on the 17th of November, 1859.

**WARD, WARDSHIP.** See GUARDIAN.

**WARD-MOTE**, the public meeting of the town in early English, and thenceforward into the feudal times, answering to the hundred-mote or shire-mote of the country at large. Ward-motes were held not less than thrice a year, and had judicial and administrative as well as elective functions with regard to the borough.

The term is now used in large towns, especially in London, to signify the meetings of the citizens in their wards for municipal purposes.

**WARE**, a small town of England, in the county of Hertford, 22 miles north of London by rail, situated on the Lea. It has three churches, and there are several chapels for dissenters, a handsome corn exchange and cattle market, town-hall, literary institute, and some good schools. There is also St. Edmund's College (1795), with a chapel by the elder Pugin. There is considerable trade in grain and coal. The town is also the chief seat of the malting trade in the kingdom, most of the malt-houses being engaged in supplying the London breweries. At one of the inns was formerly a large bedstead, 12 feet square, elaborately carved in oak, and of uncertain origin and use. It is alluded to by Shakespeare ("Twelfth Night," act iii., scene 2.) and is popularly known as the Bed of Ware. It is now at the Rye House. Near Ware are the head-springs of the New River, by which water is conveyed for the supply of the northern part of London. The population of the parish in 1881 was 5745; of the town, 5277.

**WAREHAM**, a small town of England, in the county of Dorset, on the South-western Railway, 123 miles south-west of London, and 15 miles south-east of Dorchester, near Poole Harbour, situated between the Frome and the Piddle, whence its name has been derived—Saxon *Wearth-ham*, "the dwelling on the land between two waters." It is still surrounded on three sides by ancient earthen ramparts. The harbour, which afforded a favourite landing-place for the Danes, is choked up. There is some trade in agricultural produce, and in fine potter's clay. There is an interesting church on the site of the wooden chapel where the body of Edward the Martyr lay for some time. The town was the birthplace of Horace Walpole. Under the Act of 1885 the town ceased to send a separate representative to Parliament. The population in 1881 was 2112.

**WAREWORTH**, a growing seaport of England, in the county of Northumberland, situated on the Coquet, 316 miles from London by rail. Ainslie, one mile south-east, is the port, and large sums have been spent on improving the harbour. There is a large export of coal, and brick-making and salt manufacturing are carried on. There is a considerable herring fishery. The ancient castle of the Percys still stands, and the hermitage and chapel of Percy's poem lie half a mile distant. The population of the parish in 1881 was 6917; of the township, 662.

**WARMINSTER**, a market-town of England, in the county of Wilts, on the Great Western Railway, 20 miles W.X.W. from Salisbury, and 114½ miles from London, stands in a healthy situation, close upon the western border of Salisbury Plain, in the valley of the Willey, and about a mile north from that river. It consists of several streets, the principal one extending along the road from Salisbury to Frome, and its general appearance is neat and respectable. The parish church is spacious and handsome, with a tower of the time of Edward III. There is also an ancient chapel of ease and other churches. Warminster also contains several places of worship for dissenters; a handsome town-hall, erected by the Marquis of Bath, with a suite of rooms for assemblies; literary institute, national and grammar schools, and atheneum; a cottage hospital, erected in 1866; large breweries, extensive foundries, and important manufactures of agricultural implements; but broadcloth, formerly an important manufacture, is now no longer made. The weekly corn-market held in the town is a very important one, and there is also a trade in malt. Near Warminster is Longleat House, the magnificent seat of the Marquis of Bath. The population in 1881 was 5610. Warminster is supposed to have been a Roman station, from the discovery of coins, weapons, a tessellated pavement, and other antiquities in the vicinity. Its name is derived from a nunnery that formerly existed on the site.

**WARP**, an East Anglian provincial term, applied especially to the deposit of mud or silt laid down by the sea-water artificially introduced over low-lying lands in Lincolnshire and the adjoining counties. The "warped" lands at the mouth of the Humber, produced partly artificially and partly naturally, are said to occupy an area of no less than 300 square miles.

**WARP**, in naval technique, a rope laid out for the purpose of moving a ship, which is then said to be *warped* into its prescribed position. A vessel is frequently *warped* into harbour when the entrance is narrow or difficult of access. In **WEAVING**, the warp is the *longitudinal* threads of a woven fabric, which are crossed by the *woof* or *transverse* threads.

**WARPING** (Fr. *guerpiér*), the operation of increasing the fertility of tillage lands on the banks of rivers which are liable to inundations. It appears that this mode was first introduced in England on the banks of the Ouse, the Trent, and other streams which flow into the estuary of the Humber. As they traverse a great extent of alluvial country, their waters, after heavy rains, are charged with mud and earth, and while in this state they are conducted over the adjacent lands in portions inclosed by embankments, and there permitted to deposit their burden. The deposit is called the *warp*, and as it is frequently 2 or 3 inches deep it greatly increases the fertility of the soil.

**WARRANT**. A warrant is a delegation by A, who has power to do some act of that power to B. A sheriff who has power to arrest, &c., may give a warrant to his bailiff to act for him. A landlord who has power to make a distress upon his tenant may give a warrant of distress to another for that purpose. A magistrate who has authority to bring before him persons who are within his jurisdiction, and reasonably suspected of having committed certain offences, may make a warrant to others to do that act. A



warrant should be in writing, and ought to show the authority of the person who makes it, the act which is authorized to be done, the name or description of the party who is authorized to execute it, and of the party against whom it is made, and in criminal cases the grounds upon which it is made. The sense in which the word warrant is more generally known relates to criminal matters. The warrant should always be under the hand and seal of the justice who gives it; and it should be addressed to the constable or constables, or to some private person by name; and the constable or the private person acting within the justice's jurisdiction will not be liable for any of the consequences of obeying a proper warrant. The warrant must name the person against whom it is directed. A warrant to apprehend all persons suspected, or all persons guilty, &c., is illegal, for the pointing out of the individual person to be apprehended is the function of the justice, not of the officer. The warrant should also set forth the time and place of making it, and the cause for which it is made. A warrant may be to bring the party before the justice who grants it, or before any justice of the same county. A warrant of a justice of one county cannot be executed in another until it has been backed, that is, signed by some justice in that other county; and the same provision has been also enacted with respect to warrants granted in any one of the three kingdoms, and requiring to be executed in any other. A warrant is in force until it has been executed, if the justice who granted it be still alive. After the party is apprehended the officer ought forthwith to carry him wherever he is directed by the warrant. Much of what has been said as to a warrant of apprehension is equally applicable to a warrant of commitment, by which a justice authorizes a commitment of a party to prison, either to suffer a summary punishment or to await his trial. A search warrant is a document which authorizes a search to be made for stolen goods.

A Warrant of Attorney is a writing by which a man authorizes another to do an act for him, as his agent or deputy. [See POWER OF ATTORNEY.] Dock Warrants are documents issued by dock-owners, stating that the goods mentioned in them are deliverable to a person therein named, or to his assigns by indorsement. A Share Warrant is a certificate stating that the bearer is entitled to a specified number of shares in a company.

**WARRANT OFFICERS** are certain men in the army and navy who are appointed by warrant. In the navy they are the boatswains, gunners, and carpenters, and in the army the sergeant-majors, bandmasters, first-class schoolmasters, and master gunners. The rank in both services is junior to commissioned officers, and senior to non-commissioned (in the army) and to petty (in the navy).

**WAR'RANTY.** The doctrine of warranty of lands was formerly an important part of legal learning; but has now become of little practical use. Still it is necessary for those who would properly understand the English law of real property to pay some attention to this difficult subject. All the learning upon the subject is contained in "Coke upon Littleton," with the notes of Hargrave and Butler.

As to things personal, a purchaser of goods and chattels may have satisfaction from the seller, who sells them as his own, and whose title is defective, without any express warranty, if there be any fraudulent misrepresentation or concealment by the vendor; but it seems not otherwise. But the vendor is not answerable for the quality of the wares unless he warrants the quality, or unless he knew the goods to be not sound and good, and has used art to disguise the defects, or has misrepresented them to the buyer. No particular form of words is necessary to make a warranty. There also may be warranty by implication, as when goods are sold by sample. The various rules as to warranty may be found in books which treat of contracts.

In Scotland there are various kinds of warranty in

sales of land—(1) *real*, where one parcel of land is pledged for another; (2) *absolute*, where a vendor guarantees a title against all objections, but claims arise only on eviction; (3) *from fact and deed*, where he only warrants the title from his own acts, past and future; and (4) *simple*, where he undertakes to do nothing inconsistent with the grant. In sales of movables, under the Mercantile Law Amendment Act, warranty of quality is not implied, unless the goods are sold for a specified purpose, in which case they must be fit for such purpose, or unless the goods are ordered of a particular description, in which case they must be saleable under that description. Warranty, if given, must be express, and may be proved by parol.

**WAR'REN, FREE.** A free warren is a franchise which gives a right to have and keep certain wild beasts and fowls, called game, within the precincts of a manor, or any other place of known extent, whereby the owner of the franchise has a property in the game, and a right to exclude all other persons from hunting or taking it.

**WARREN, SAMUEL, D.C.L., Q.C., M.P.**, known chiefly as a writer of fiction, was born in May, 1807, in the parish of Gresford, Denbighshire. After studying medicine for some years, he prepared for the church; he finally resolved to go to the bar. Between 1830 and 1837 appeared in *Blackwood's Magazine* his well-known "Diary of a Late Physician," rejected in MS. by the editors of the chief London periodicals, but welcomed by Mr. William Blackwood. In the same magazine appeared afterwards his "Ten Thousand a Year," a novel always popular, and now truly valuable for its excellent account of bygone legal quibbles. He became a queen's counsel in 1851, recorder of Hull in 1852, and in 1856 he entered the House of Commons as Conservative member for Midhurst, but resigned on being appointed by Lord-chancellor Chelmsford, in February, 1859, a master in lunacy. In June, 1858, the University of Oxford conferred on him the degree of D.C.L. Died 29th July, 1877.

**WAR'RENPOINT**, a small town of Ireland, in the county of Down, situated on Carlingford Bay, at the mouth of the Newry River, 5 miles S.S.E. of Newry. There is a good quay, and steamers ply to Glasgow, Liverpool, and Dublin. The town is much frequented for bathing. It was founded on the site of a rabbit burrow in 1780. The population in 1881 was 2194.

**WARRINGTON**, a parliamentary and municipal borough of England, in the counties of Lancaster and Chester, 182½ miles from London, having ready communication with Liverpool and Manchester. Warrington is a place of great antiquity, and stands at a point where one of the principal Roman roads crossed the river Mersey. It is described in Domesday Book under the name of Walintune, and was then the chief place of a hundred of the same name that has since been united to the hundred of West Derby. It clusters on the right bank of the river, among fertile market gardens, and consists of some modern streets and several old and narrow ones, which contain many ancient timber houses. Warrington Bridge was for many ages the principal means of communication between Lancashire and Cheshire, and near to it the London and North-western Railway crosses the same river. The town was made a parliamentary borough by the Reform Act of 1832. A municipal charter was granted in 1817, by which the town is divided into five wards, and governed by a mayor, eight aldermen, and twenty-seven councillors. The parliamentary and municipal limits are nearly continuous; the number of inhabitants comprised within them at the census of 1881 being 45,253 and 41,456 respectively. The area of the borough is about 4000 acres, and comprises, besides the township of Warrington, portions of Latchford and Thelwall, both in Cheshire. Warrington is between Liverpool and Stockport, to which towns, and to Manchester, St. Helens, Newton, Wigan, Preston, Crewe,

Chester, &c., lines of railway run. The first stage-coach from Lancashire to London began to run from Warrington in the year 1757, and made the journey in three days and three nights. During the Civil War, Warrington and the neighbourhood was the scene of many skirmishes between the royal and parliamentary armies. The principal buildings are, St. Elphin's Parish Church, to the east of the town, of Saxon origin, a large, ancient, Decorated-English and cruciform building, of various dates, with five other churches, numerous chapels, post-office, sessions house, church and mechanics' institute, public museum and library, baths, savings' and other banks, diocesan training college for schoolmistresses, free grammar-school, founded 1526, clergy orphan daughters' school, blue-coat hospital and other schools, almshouses, dispensary, infirmary, lying-in hospital, and a union poor-house. A public hall of handsome appearance was opened in 1862. Besides these there are—a market-house, assembly rooms, and a theatre. In 1873 Bank Hall, the former residence of Colonel Wilson Patten, was transformed into a town-hall, the grounds in which it stands having been converted into a park. The chief branches of industry in Warrington are cotton spinning, the manufacture of flint glass and glass bottles, soap, machinery, and mill-work, and many branches of iron manufactures. The town is the centre of the heavy leather manufacture of the north of England. There are steam flour mills, tan-yards, malt-houses, and several breweries—Warrington being famous for its ale. The Mersey is navigable up to Warrington at spring tides for very large vessels, and ships of 800 to 1000 tons have been built there and floated down to Liverpool. The Mersey and Irwell Navigation passes close to Warrington, as well as the Sankey Canal and the Duke of Bridgewater's Canal. Warrington returns one member to the House of Commons. It boasts of issuing the first newspaper in Lancashire.

**WARS OF THE ROSES.** See ROSES, WARS OF THE.

**WAR'SAW** (Polish, *Warszawa*; German, *Warschau*; French, *Varsovie*; Italian and Spanish, *Varsoria*), formerly the capital of the kingdom of Poland, and now the chief city of the Russian province of Warsaw, is situated partly on a flat, and partly on an eminence rising gradually above the left bank of the Vistula, in 52° 13' N. lat., 21° 2' E. lon., and contained about 406,261 inhabitants in 1882. It is connected by railways with Vienna and Berlin (from each of which it is about 340 miles in a straight line); and also with Leipzig, Cracow, and St. Petersburg—the latter 668 miles distant.

Warsaw consists of the city itself—divided into the old and new towns—and of several suburbs; the total circumference of which is 10 miles, but many gardens and fields are included in this area. The suburbs possess some spacious roads and handsome buildings; but in the old city the streets are generally narrow, ill arranged, and dirty. There are no regular fortifications, but the town is surrounded with lines, and after the insurrection of 1830 a very strong citadel was erected with a view of overawing the inhabitants, and preventing any further outbreak. From its situation this citadel commands every part of the city. Formerly Warsaw was connected with Praga, on the opposite bank of the Vistula, by a bridge of boats 1600 feet long; but this has been removed, and a fine iron bridge on granite piers erected in its stead. The suburb of Praga, though at one time extensive, is now totally decayed, and all but deserted. Warsaw has an imposing appearance from a distance—especially from the St. Petersburg road—on account of its being built on the ascent from the river, which of course displays its public buildings to the best advantage. This impression is, however, dispelled on entering the town, which, internally, presents striking contrasts of magnificence and misery; for most of the private houses are mean, and the streets

and squares generally badly paved. One of the most interesting public buildings is the *Zamek*, a royal palace built by King Sigismund III., who transferred his court to this place from Cracow in 1566. It contains the hall of the Polish Diet, and the archives of the kingdom. The Krasinski Palace, a very fine building, now used by the government, contains the national theatre, custom-house, high tribunals, and public offices; and also has attached to it some gardens, which are a fashionable place of resort. The other principal edifices are—the Casimir Palace or Academy of Sciences, with a statue of Copernicus (who was a Pole by birth), erected in 1830; the exchange, the old archiepiscopal residence, the university, the palaces formerly belonging to Counts Radzivil and Brühl, nearly 100 other mansions of the Polish nobility; the Roman Catholic Cathedral of St. John, which is a Gothic building of great beauty, dating from 1250, and contains a fine altar-piece, besides many interesting statuettes and monuments; a Greek united cathedral, many other places of worship. Synagogues are numerous, there being more Jews in Warsaw than in any other city in Europe. Warsaw also contains a national bank, established by order of the Emperor Nicholas in 1828; a mint, arsenal, barracks, and school of artillery, six hospitals, deaf and dumb asylum, observatory, botanic garden, musical conservatory, and numerous charitable and useful institutions. Its once famous university was suppressed after the insurrection of 1830 (the valuable library of 150,000 volumes being removed, with many art treasures, to St. Petersburg in 1831), but it was re-established in 1864 through the instrumentality of the Grand-duke Constantine, the governor of the district. The other educational establishments are a theological seminary, rabbinical college, several gymnasia, schools of art, numerous Russian schools, libraries, &c. The Russian language is compulsorily taught in all the schools, and everything published in the city is subject to the most rigorous censorship.

The principal articles made in Warsaw are woollen and linen fabrics, hosiery, hats, gold and silver wares, saddlery, paper, and tobacco; and some of the inhabitants are also employed in chemical and cotton printing works, breweries, &c. There are large fairs in May and September, which are frequented by the merchants of both Europe and Asia. The Vistula at Warsaw is much broader than the Thames at Westminster. The river is very shallow, and its bed is constantly shifting, so that it is only navigable for large vessels when it is swelled by the autumn rains, or when torrents of melted snow pour down into it from the Carpathians after a thaw. The principal trade is in wheat, which is sent to Dantzic for shipment.

There are several large and memorable squares in the city, containing many fine statues, the most striking of which is a gilt bronze figure of King Sigismund III., erected by his son, Ladislas IV. This stands on a marble column 26 feet high, before the Cracow gate, and in an enclosure called the Sigismund Square. In the Church of the Capuchins is a splendid monument in honour of King John Sobieski, erected by the Emperor Nicholas. Warsaw is also furnished with some of the finest drives and promenades of any European city. The favourite retreat of Sobieski, the chateau of Willanow (with a fine park), is about 3 miles from the town. The field of Vola, where the Polish kings were formerly elected by the nobles, is 5 miles distant.

Warsaw succeeded Cracow as the capital of Poland in 1566. In 1807 it was made the capital of the Grand-duchy of Warsaw, and in 1815 of the Russian kingdom of Poland. In 1830 the Russians were driven from it by the Poles, but they retook it in 1831. In 1861 another insurrection broke out, which was suppressed with great severity.

**WART**, an excrescence of the skin, consisting of elongated papillæ of the dermis covered with cuticle, the nature of which is not very well understood. Warts vary in size,

and are modified according to situation. They sometimes cover a considerable extent of surface in patches several inches in diameter, but more commonly appear as small isolated prominences, either singly or in clusters. Warts are sometimes caused by compression and by neglect of cleanliness, but in many instances they come and go without apparent cause, especially in the young, and may go on increasing in spite of all treatment. As a rule they produce no ill consequences, and must be regarded rather in the light of a blemish than a disease.

The best method of treating warts is to touch them with some solvent, such as nitrate of silver or acetic acid. When a wart is touched with the latter the acid dissolves the skin, and reaching the vascular papillæ destroys the whole structure down to its roots, the pulpy mass drying up into a scab, which falls off and leaves the skin clear.

**WART-HOG** (*Phacochoerus*) is a genus of the *PIG* family (*Suidæ*), differing from the true pigs remarkably in their dentition. The canine teeth are developed in the form of large recurved sharp tusks, directed upwards and outwards. The hindmost molar teeth are massive, and resemble those of an elephant; they consist of prisms of enamel surrounding a central mass of dentine and united by the investment of cement into a single tooth. All the molar series except these are shed in the old animal. There are two incisor teeth in the upper, and six in the lower jaw. The head is very large and the muzzle broad, and there are large wart-like excrescences beneath the small eyes. *Ælian's* Wart-hog (*Phacochoerus æliani*) is a native of Abyssinia and Central Africa from Mozambique to Guinea. The body is nearly 4 feet in length, and is of a reddish colour, sparsely clothed with bristly hairs, which form a well-developed mane along the neck and back. The tail measures about a foot, and is naked, except at the extremity, which is tufted. It feeds on roots and bulbs, which it digs up with its powerful tusks. The Ethiopian Wart-hog (*Phacochoerus æthiopicus*) is a native of the southern parts of Africa. It is the value-vark of the Dutch colonists of the Cape of Good Hope. It is rather larger than the preceding species, with which it agrees in its habits.

**WARTON, JOSEPH, D.D.**, the poet and critic, born in 1722, was the elder brother of Thomas Warton the poet-laureate, and son of the Rev. Thomas Warton, professor of poetry at Oxford. At Winchester College, he had the poet Collins for a school-fellow, and both already began to write verses, some of which were even printed in the *Gentleman's Magazine*. From Winchester he went to Oriel College, Oxford. He entered the church in 1744. In 1756 he published the first volume of his celebrated "Essay on the Genius and Writings of Pope," in which he expounded elaborately the thesis broached in the preface to his early volume of odes, placing Shakespeare, Spenser, and Milton in the first class as poets of imagination and passion, while the poets of reason were relegated to an inferior rank. It was a proclamation of the superiority of the romantic to the classical element in poetry, and is the most systematic manifesto of what has been called the "Warton School" of criticism. The second volume was not published until 1782. In 1766 he was made head master of Winchester. In 1797 was completed the publication of his edition of Pope's works, with notes. He had finished two volumes only of a similar edition of Dryden, when he died in February, 1800. His poetry was of less mark than his criticism, which was much in advance of his age.

**OWARTON, THOMAS**, the poet laureate, was the younger brother of the preceding, and born at Basingstoke in 1728. He obtained a fellowship at Trinity College, Oxford, in 1751. Six years later he was elected professor of poetry at Oxford. He had published some minor works, when in 1771 he was presented to the small living of Kildington, in Oxfordshire, almost the only ecclesiastical pre-

ferment which he received. In 1774 was published the first volume of the work by which chiefly he is remembered, "The History of English Poetry," of which the third volume appeared in 1781. In 1785 he was appointed Camden professor of history, but contented himself with delivering an inaugural discourse. In the same year he succeeded Whitehead as poet-laureate, and published his edition of Milton's minor poems. Warton died in 1790. His History has done more than any other single work to diffuse a knowledge of, and to rouse curiosity respecting our antique poetry. Unfortunately, it is a fragment, breaking off abruptly with the satirists of the Elizabethan age, and leaving its great poets and dramatists untouched.

**WARWICK, EARLS OF**, one of the most illustrious of an ancient feudal title of England.

*Beauchamp*.—The founder of this house was Hugh de Beauchamp, the companion-in-arms of William the Conqueror, and a large sharer in the spoils of the Conquest. His descendant, William de Beauchamp, lord of Elmly, in the reign of Henry III., married Isabel, sister and heiress of William Mauduit, earl of Warwick, and their eldest son, William, inherited this famous title, which had been originally possessed by the Newburghs. This nobleman fought with great distinction in the Welsh and Scotch wars of Edward I. His son Guy, second earl, acquired high military renown at the battle of Falkirk, and was rewarded with extensive grants of land in Scotland. He was a party to the league against Piers Gaveston, the favourite of Edward II., who had nicknamed the earl "the Black Dog of Ardennes," and when that unhappy minion fell into the hands of his enemies upon the surrender of Scarborough Castle in 1312, the earl laid violent hands upon him, and after a summary trial caused him to be beheaded at Blacklow Hill, near Warwick. For this and other unwarrantable proceedings, Warwick afterwards extorted a pardon from his feeble sovereign; but he is said to have ultimately died of poison administered in revenge by the partisans of Gaveston. This potent nobleman was a munificent benefactor of the church. Thomas, third earl, held an important command both at Crécy and Poitiers. After these heroic achievements he took the cross, and gained fresh renown on the plains of Palestine. This nobleman rebuilt Warwick Castle, originally erected by Henry de Newburgh, a follower of William the Conqueror, but destroyed in 1265. He was one of the original Knights of the Garter. Thomas, fourth earl, was appointed by Parliament governor to Richard II. in his minority, but was soon dismissed by the young and facile monarch, who allowed himself to be governed by his worthless favourites. The earl was afterwards seized at a feast given to him by the king, and condemned to death, on the charge of having several years before taken up arms along with the Duke of Gloucester. His sentence, however, was commuted into banishment to the Isle of Man, while his castle and vast estates were bestowed on the Earl of Kent. They were restored by Henry IV. after the deposition of Richard. Richard, fifth earl, styled "The Good," and, by authority of the Emperor Sigismund, bearing the title of the "Father of Courtesy," was famous for his courage and military skill. Henry V. created him, in 1417, Earl of Aumerle for life, employed him in many important services, and appointed him by his will governor to his infant son and successor, Henry VI. In 1437, on the recall of the Duke of York from the regency of France, the Earl of Warwick, who had previously acted as regent, was sent over as his successor. He died at Rouen in 1439; but his body was brought over and interred in the Church of St. Mary at Warwick, in a magnificent tomb which cost the enormous sum of £2481. His son Henry, sixth earl, was a great favourite with Henry VI., who created him, on 2nd April, 1444, premier-earl of England, and three days after Duke

of Warwick, with precedence next to the Duke of Norfolk. He was also crowned by Henry himself king of the islands of Wight, Jersey, and Guernsey. But he did not long enjoy these honours. He died on the 11th of June, 1415, when his dukedom became extinct. The honours and estates of the illustrious house of Beauchamp devolved on the sister of the duke, Anne, wife of Richard Neville, the renowned King-maker, and the eldest son of Richard Neville, earl of Salisbury, a Yorkist commander, taken at Wakefield in 1460 and beheaded.

*Neville.*—Richard Neville, who became second earl of Salisbury in 1460, and was created earl of Warwick on his marriage with the heiress of the Beauchamps (1449), was the greatest man of his family, and the strength and glory of the party of the White Rose. The alliances, honours, and estates of the Nevilles at this period have never been equalled by any English house. The head of the family was the great Earl of Westmorland. The three uncles of the Earl of Warwick were Barons Fauconberg, Abergarney, and Latimer; his brother was Baron Montague; his uncle Richard, duke of York, was the lineal heir to the throne; while the Talbots, Beauchamps, Percys, Scroops, and other great old families were connected with the house by marriage. In addition to his extended connections and vast possessions, the "stout earl" greatly increased his influence by his eminent personal qualities, his courage and military renown, his general talent, frankness, and affability, and his boundless hospitality. He kept open house wherever he resided, and 30,000 persons are said to have been entertained daily at his various mansions.

Like his father he took the Yorkist side in the Wars of the Roses, and he mainly contributed by his impetuous valour to gain the battle of St. Albans, in 1455, in reward for which service he was created captain-general of Calais, at that time the most important military charge in Europe. Two or three years later Henry VI. himself gave him the command of the fleet for five years, and a grant of precedence above all the earls of England. When the Yorkists again took up arms in 1459, Warwick came over from Calais, and commanded the van of the army at Northampton when the king fell into the hands of the victors. The earl shared, however, in the reverses of his party in the ensuing battles of Wakefield (30th December) and St. Albans (17th February, 1461), the former of which proved fatal to his father and uncle, while the latter restored Henry VI. to liberty. But immediately after this last defeat Warwick united his forces to those of Edward, now duke of York, compelled the Lancastrians to retire to the north, and marching to London, proclaimed his cousin king by the title of Edward IV. (4th March). He then followed Queen Margaret into Yorkshire, and by the great victory of Towton (29th March), secured the throne to the new monarch. No reward seemed too great for the services of the puissant baron. He obtained immense grants of territory, was constituted general warden of the West Marches on the Scottish border, constable of Dover, great chamberlain of England for life, and lord high-steward. Suspicious and jealousies, however, by and by arose between Edward and his too powerful kinsman, and the marriage of the king contributed to widen the breach. Warwick's brothers, the Earl of Northumberland and the Archbishop of York, were deprived of their offices in 1467, and the earl left the court in high displeasure. At length Warwick and his son-in-law Clarence (Edward's brother) fled to the Continent in 1470, and there effected a reconciliation with Queen Margaret, sealing their alliance by the marriage of Prince Edward, Margaret's son, to Warwick's second daughter, Anne. The earl then embarked for England at the head of a powerful force, and landing at Plymouth, 13th August, proclaimed Henry VI. king. Edward fled to Holland. In March, 1471, Edward landed with a body of troops at Ravenspur in Yorkshire, and succeeded

in inducing first Clarence, and then the Archbishop of York, to abandon the cause of Warwick. On the 14th of April the two armies encountered at Barnet, and notwithstanding the skill and valour of the great earl, the Lancastrians were defeated, and Warwick and his brother, the Marquis of Montague, slain. The "King-maker" left two daughters, Isabella, married to the Duke of Clarence, brother of Edward IV.; and Anne, whose first husband, Edward, prince of Wales, was put to death in cold blood in 1471, after the battle of Tewkesbury, and who was married the next year to the Duke of Gloucester, afterwards Richard III.

*Plantagenet.*—Edward Plantagenet, son of Clarence, and grandson of the "King-maker," became Earl of Warwick on the death of his father, 1478. He was the Yorkist heir to the throne after the death of Richard III., and consequently was at once secured and imprisoned in the Tower by Henry VII. after his victory at Bosworth (1485). It was this prince whom Simnel personated, and in whose name he was crowned Edward VI. in Dublin, 1487. Warwick was taken from the Tower and shown to the citizens of London to defeat the imposture. When Perkin Warbeck personated the "little Duke of York escaped from the Tower" (and from Richard III.), the opportunity was taken to accuse Warwick of complicity, and on this absurd charge to behead the "last of the Plantagenets" in the Tower (1499).

*Dudley.*—John Dudley (1502-53), son of the infamous minister of Henry VII., who was attainted and beheaded by Henry VIII. on his accession, was restored to his father's honours by the latter king, and created Lord Lisle and Lord High Admiral in 1523; and Earl of Warwick by Edward VI. in 1547. In 1551 he became Duke of Northumberland, and his attempt to seat his daughter-in-law, Lady Jane Grey, upon the throne brought him to the block in 1553. His son, Ambrose (1530-89), second earl, was also condemned to death, but being pardoned behaved so bravely in the Low Countries, that Elizabeth reversed the attainder. He died defending Newhaven, 1589.

*Rich.*—Again the famous title was revived for the Rich family. The second earl of this family, Robert Rich, succeeded his father in the dignity in 1618. He took the Parliament side in the Civil War, and was appointed High Admiral by the Long Parliament (1619). He laid down his command in 1645 under the "Self-denying Ordinance." He was a steady adherent and life-long friend of Cromwell, and bare the sword before him at his inauguration as Lord Protector, and he sat in Cromwell's House of Lords. His grandson married Frances Cromwell, but Mr. Rich, the Earl, and Cromwell all died (following the order named) in 1658, and the title again perished.

*Greville.*—The ancient barony of Brooke (the first baron being the famous Fulke Greville, created Lord Brooke 1620) was raised to an earldom by George II. in 1716; and the same king, in 1759, revived the earldom of Warwick in favour of the Earl of Brooke. The joint title of Warwick and Brooke is still in the Greville family.

**WARWICK, GUY, EARL OF**, a semi-mythical hero of Anglo-Danish times, supposed to have flourished early in the tenth century, whom the fair Pheliss refused to marry till he had won his spurs. Accordingly he rescued the emperor's daughter in Germany, fought in the Holy Land against the Saracens, and slew the King of Tyre and the Sultan of Damascus. Then he came home to England to marry Pheliss. In forty days he departed again for Palestine to free English earls from prison and slay giants. After this he returned to his native land, but by no means to rest. First he redeemed England from Danish tribute by slaying in single combat the Danish giant and hero Colbrand; then he rid Windsor of a terrible wild boar which harassed the forest side, slew the Dun-cow of Dunsmore Heath, "a monstrous wyld and cruell beste," and despatched a dragon

"black as any cole" in Northumberland. This done he repented of his sins, dug himself a cave near Warwick, and daily begged his bread at his own castle gates unrecognized by his wife. On his deathbed he sent Lady Phelis a ring by which she knew him and came to receive his last breath. The combat with Colbrand is told elaborately and with great spirit by Drayton in the "Polyolbion."

Sir Guy's legend was one of the most popular in mediæval times. In the riot in palace-yard ("Henry VIII." act v., scene 1) Shakespeare makes the angry porter's man defend himself with—

"I am not Samson, nor Sir Guy, nor Colbrand,  
To mow them down before me."

**WARWICKSHIRE**, a midland county of England, is bounded N. for a limited extent by Derbyshire, N.E. by Leicestershire, E. by Northamptonshire, S.E. by Oxfordshire, S. and S.W. by Gloucestershire, W. by Worcestershire, and N.W. by Staffordshire. In outline it is irregular, but its general shape may be roughly described as an oval. The greatest length north to south is 51½ miles; the greatest breadth east to west is 36 miles. A detached portion of the county on the west is wholly inclosed by Worcestershire, in the neighbourhood of Bromsgrove; and another detached portion on the south-west, near Shipston-on-Stour, is surrounded by portions of Worcestershire and Gloucestershire. The area is 885 square miles, or 566,271 acres. The number of inhabitants in 1881 was 737,339.

*Surface and Geology.*—Warwickshire has no mountainous heights, but the whole county is occupied by gentle hills of moderate elevation with intervening vales. The highest ground is at Corley, in Hemlingford hundred, and in the vicinity of Packington. Ancient writers divide the shire into the Fildon, or level country, and the Arden, or woodland, the line of separation being the Avon; but no such distinction now exists. The south-eastern border is skirted by hills composed of the lower formations of the Oolitic series, overlooking the valley of the Stour and the Vale of Red Horse, anciently so called from a colossal figure of a horse carved in the ferruginous sands of the base of Edge Hill, which has been obliterated by the progress of inclosures, and replaced by one of much smaller dimensions. Extensive quarries of gritstone, part of the Oolitic series, occur on Compton Hill. The valley of the Stour and the Vale of Red Horse, which skirt the foot of the Oolitic hills, are occupied by the beds of the Lias formation. The remainder of the county chiefly consists of formations of the red marl and new red sandstone group, and is included in the great midland red marl and new red sandstone district. There is but one coal-field; it extends in length 16 miles S.E. to N.N.W., with an average breadth of about 3 miles.

The principal minerals are freestone, limestone, blue flintstone, ironstone, blue clay, marl, and manganese. Mineral springs are found at Leamington (where they are still much frequented), Kington, Stratford-on-Avon, Southam, Willoughby, King's Newnham, and on the Coles-hill road, near Birmingham.

*Rivers, Canals, and Railways.*—The greater part of Warwickshire belongs to the basin of the Severn; a considerable portion in the north is included in the basin of the Trent, and a small portion to the south-east in that of the Thames. No part of the course of the Severn is in the county; the drainage of which is conveyed into that river by the Avon, one of its most important tributaries. The Avon rises in Northamptonshire, and enters Warwickshire under Dove Bridge, about 12 miles from its source. From Dove Bridge it flows in a winding channel west and south-west to Warwick, traversing the Castle Park, and running south and south-west to Stratford-upon-Avon; thence it proceeds, partly within, partly upon the border of the county, till it quits it just above Harvington Mill. Its course in Warwickshire is altogether 57 miles, and its

total length in round numbers 100 miles. The navigation does not extend above Stratford, so that it is navigable only for 42 miles, or less than half its course. Its feeders are, the Swift (10 miles long), the Sow (20 miles), the Leam (30 miles), the Deno (13 miles), the Stour (24 miles), and the Arrow (18 miles).

That part of the county included in the basin of the Trent is drained by the Tame, which rises about 3 miles north-west of Wallsall in Staffordshire, and flows south-east to Aston, near Birmingham, above which it enters Warwickshire. It then runs east; afterwards turning north it quits the county at Tamworth, and still preserving its northward direction enters the Trent at Alrewas in Staffordshire. Its whole course is about 44 miles, of which 22 miles are in Warwickshire or on the border. Its feeders are, the Rea (12 miles long), the Blythe (18 miles), the Bourne (10 miles), and the Anker (26 miles). Neither the Tame nor any of these affluents is navigable.

The deficiency of river navigation, which in Warwickshire is limited to a small part of the course of the Avon below Stratford, is compensated by the number and importance of the canals. The construction of the Grand Trunk, or Trent and Mersey Canal, which follows through Staffordshire and Derbyshire the course of the Trent (the first Act for which was obtained in 1766), may be considered as having given the first impulse to the canal navigation of Warwickshire, though no part of the Grand Trunk is within that county. In 1768 an Act of Parliament was obtained, authorizing the foundation of the Coventry Canal, which commences in the Grand Trunk, near Alrewas, in Staffordshire, and extends to Coventry. Its whole length is nearly 38 miles, 27 of which are in Warwickshire. The Oxford Canal was commenced under an Act obtained in 1769. It starts from the Coventry Canal at Longford, and opens into the Thames at Oxford. Its whole length is about 84 miles, of which about half is in Warwickshire, and half in Northamptonshire. The county is intersected by the London and North-western, Great Western, and Midland railways.

*Agriculture.*—This county, being situated nearly in the centre of England, enjoys a comparatively mild and healthy climate. Except in the higher and more exposed situations, where the land is cold and heavy, the harvest occurs as early as in the southern districts.

The soil varies extremely, two or three different kinds being often met with in a field of no great extent. The red loam, which is found to a considerable extent across the centre of the county, especially between Warwick and Coventry, and from the borders of Worcestershire to Leicestershire, is mostly of a superior quality, all of it very fit for white crops, and much of it capable of bearing both beans and turnips. Where the loam inclines to sand the subsoil is chiefly limestone, marl, or sandstone; and under the colder and heavier loams the substratum is clay. There is also a fertile clay on limestone.

On the light loams and sands turnips have long been cultivated. A great extent of excellent pasture-land is laid down. On the heavy soils in this county, as in most others, the custom of continually ploughing from the crown and gathering the furrows, as it is called, had produced such high ridges that a man might be hidden behind them; and the water always running down the steep sides of the ridge, formed a kind of morass in the deep intervals. Most of these high ridges, however, have since been levelled, and a better system of ploughing introduced. Thorough draining has made considerable progress; and where the subsoil is clay, the practice will no doubt soon become universal. The great superiority of the rich loams lying on sandstone arises in part from their being under-drained by nature, without which all their natural fertility would have been of little advantage.

At one time the forest of Arden occupied a large portion of the centre of Warwickshire, which is still extremely well wooded, and the scenery, in general remarkably rich and charming, is varied by moor and heath.

**Manufactures.**—Warwickshire ranks high as a manufacturing county. Birmingham is the principal seat of hardware; and nowhere, perhaps, has the combined influence of ingenuity, skill, and capital been more astonishingly displayed than in the immense variety, beauty, utility, and cheapness of the articles produced in this great workshop. Coventry has been long distinguished for its proficiency in the silk trade, especially ribbons, and for the manufacture of watches and cycles. Needles and fish-hooks are made at Alcester. There are also manufactories for making paper, boots and shoes, gloves and stockings, lace, glass, carriages, and chemicals in various parts of the county.

**Divisions.**—Warwickshire is divided into four hundreds, and 206 parishes. It is in the diocese of Worcester, and comprehends the archdeaconry of Coventry and part of the archdeaconry of Worcester. It is in the Midland Circuit, the assizes being held at Warwick. Since 1885 the county has been divided, for parliamentary purposes, into four divisions, each returning one member. Birmingham returns seven members, and one each is sent from Aston Manor, Coventry, and Warwick and Leamington (united), making fourteen members for the entire county.

**Principal Seats.**—Few English counties can boast of nobler mansions or stateries "ancestral halls" than Warwickshire. Kenilworth and Warwick Castles have been described under their respective heads; but a word or two of reference is necessary to Guy's Cliff, near Warwick, scarcely less famous for its natural than its artificial beauties; Offchurch Bury, the seat of Lord Guernsey, a Tudor Gothic building; Charlecote, 4 miles from Stratford, the domestic of the Lucy family, and indissolubly associated with the memory of Shakespeare; Bagley Park, near Alcester, the seat of the Marquis of Hereford; Combe Abbey, 5 miles from Coventry, an Elizabethan mansion of picturesque design, where Elizabeth, queen of Bohemia, was educated, and which is now remarkable for its valuable collection of pictures; Arbury Hall, near Nuneaton, the seat of the Newdegates; Astley Castle, about a mile from Arbury; Aston Hall, 10 miles from Birmingham, now the property of the people of Birmingham; and Stoneleigh, the beautiful seat of Lord Leigh, 2 miles from Kenilworth, situated on the site of an ancient Cistercian abbey, in a majestic and well-wooded park, which is watered by the Avon.

**History and Antiquities.**—In the earliest historic period this county appears to have been occupied by two tribes, the Cornavii and the Wigautes or Wiccii, who were partially subdued by the Roman governor, Ostorius Scapula, about A.D. 50, and completely reduced by Suetonius Paulinus. A great part of it was then covered with a dense luxuriant forest. In the Roman division of Britain the shire was included in the province of Britannia Secunda. Various Roman towns and stations may be identified: of these Alcester and Mancester are the most important. Three Roman roads traverse the county: the Watling Street, the Ikenild Street, and the Foss-Way. Roman coins and other antiquities have been found near Birmingham, Hampton-in-Arden, Willoughby near the Leam, on the eastern border of the county, and at Warwick; and a Roman pavement was excavated many years ago at Coventry.

In the earlier Saxon period Warwickshire, then called Weringesyre, formed part of the kingdom of Mercia. Under King Alfred it came, with the rest of Mercia south-west of Watling Street, under direct subjection to the West Saxon crown (about 886), and during part of the reign of Alfred and his son, Edward the Elder, it was governed by the Alderman Æthelred, and after his death by his wife,

Æthelflæd, Alfred's daughter. During this and the subsequent reigns it was frequently ravaged by the Danes or Northmen.

In the civil war of Charles I. the county generally embraced the cause of the Parliament, being especially swayed by the influence of Lord Brooke; and the first great battle of the war was fought in 1642 at Edge Hill, within its boundaries. Warwick Castle, the principal post of the Parliamentarians, was attacked by the Royalists in the early part of the war, but without success.

WARWICK, the county town, a parliamentary and municipal borough of great antiquity, is finely situated on elevated ground, near the bank of the river Avon, 108 miles from London. Its earlier annals are shrouded in impenetrable obscurity, but it is certain that it was a town of some importance in the Saxon era. It is said to have been named after Warremund, king of Mercia. A castle was founded here in 915, by Æthelflæd, daughter of Alfred the Great. After the Conquest, Henry de Newburgh was created Earl of Warwick by the Conqueror, and both the town and castle were considerably strengthened. In the reign of Edward I. Warwick was the scene of several tournaments. James I. visited it in 1617, and was splendidly entertained at Leicester's Hospital. It suffered severely during the Civil War, and in 1694 was partly destroyed by fire. In 1695 it was visited by William III.

The town contains several edifices of peculiar interest. Leicester's Hospital, a fine example of the ancient half-timbered building, was endowed by Robert Dudley, earl of Leicester, with estates which now yield £3000 per annum. It supports twenty-two brethren, veteran soldiers, with a yearly allowance of £80 each, and a master with an annual salary of £400. The college school was founded by Richard Beauchamp, (temp. Henry IV.) The collegiate church of St. Mary is a noble structure, which was modified about 1704, from the designs of Sir Christopher Wren. The tower is 130 feet high, and crowned with pinnacles rising to a further height of 44 feet. The extreme length of the church is 180 feet, its breadth 106. Of the original building, the choir, the lady chapel, an exquisite specimen of the purest Gothic, dating from 1413, the chapter-house, lobby, and vestry-room, are still extant. The choir is richly ornamented, and contains several interesting monuments. St. Nicholas' is a modern church, erected in 1799. The county hall was built in 1776, the courthouse in 1830. There are also two other churches, dissenting and Roman Catholic chapels, a museum, market hall, corn exchange, a county gaol, a public library, several good hotels, and a commodious railway station. In 1875 a scheme of the Endowed Schools Commissioners was sanctioned with regard to the King's School, founded by Henry VIII. in 1516, and a new building was erected in 1876. Good middle schools were also established by the same scheme, and there are some valuable scholarships and exhibitions.

Warwick Castle, "that fairest monument of ancient and chivalrous splendour, which yet remains unimpaired by time," crowns a rock, whose base is washed by the Avon, on the south-east side of the town. Some portions are of venerable antiquity, but, during the Barons' War, the main buildings were razed to the ground. The castle was then restored by Thomas de Beauchamp, earl of Warwick, temp. Edward III.; enlarged by his son, who built Guy's tower in 1391; and beautifully embellished by Sir Fulke Greville, afterwards Lord Brooke, in the reign of James I. In the Civil War it was successfully held for the Parliament. The castle and estate still belong to the Greville family, on whom the earldom of Warwick was bestowed in 1759. The second earl of this line expended large sums in the adornment of his ancestral seat, and formed its fine collection of pictures by Vandyk, Rubens, Rembrandt, Paolo Veronese, Guido, and other great masters.



In the porter's lodge are preserved the relics of the legendary Guy, earl of Warwick, including his "porridge pot" of 102 gallons. Externally, the most interesting features of the castle are the towers—Caesar's is 147 feet high, Guy's 130 feet. The green-house contains the famous ancient *chef-d'œuvre*, the Warwick vase, a circular basin of white marble, 21 feet in circumference, and beautifully sculptured, found at the bottom of a lake at Tivoli in 1771. In the interior the visitor's attention will be chiefly directed to the great hall, 62 feet long, 40 feet wide, and 35 feet high, with an elaborately-wrought Gothic roof of modern design; the great dining-room, 43 feet by 25 feet; the red drawing-room; the cedar drawing-room, 47 feet by 25 feet; the gilt drawing-room, the state bed-room, Lady Warwick's boudoir, and the compass room. Part of the castle was destroyed by fire in 1871, but it has since been restored.

Warwick is a municipal borough, governed by a mayor, five aldermen, and eighteen councillors. The county assizes are held here. The population of the borough, which comprises the parishes of St. Mary and St. Nicholas, in 1881 was 11,802. Warwick formerly returned two members to the House of Commons, but in 1885 it was united to Leamington, and the two boroughs now send one representative. In the vicinity is Blacklow Hill, where Piers Gaveston, the favourite of Edward II., was executed in 1312.

**WASH**, a large bay of the North Sea, situated on the east coast of England, between the counties of Norfolk and Lincoln, receiving the Great Ouse, Nen, Witham, and Welland rivers. It has a length of 20 miles and a breadth of 15. Large tracts on its shores have been reclaimed.

**WASHINGTON**, a city in the district of Columbia, and the political metropolis of the United States of America, is situated on the left bank of the Potomac, between that river and two of its tributaries—one called the East branch, and a smaller one named Rock Creek. It is 38 miles south-west of Baltimore, 226 from New York, 432 from Boston, about 2000 from San Francisco in a straight line, 122 from Richmond, and 1203 from New Orleans. There is railway communication, *via* Baltimore, with all the chief towns in the north part of the country; and it is connected with the cities in the south and south-west by steamboats to Aquia Creek, and thence by the Frederick-burg, Potomac, and Richmond line. The population in 1880 was 147,307. In the winter season it is a favourite residence of the wealthy Americans.

Washington is nearly surrounded by an amphitheatre of hills. The site was selected by the first president, George Washington, from whom it was named. Generally it is about 40 feet above the level of the rivers. George Town is only separated from Washington by Rock Creek, and Alexandria is 8 miles further down on the opposite side of the Potomac, over which are carried three bridges of great length; the river here being very wide, and of sufficient depth for the largest vessels, although it is nearly 300 miles from the sea. Washington is regularly laid out in wide streets running north and south, crossed by others from east and west, and there are also broad avenues which traverse the rectangular divisions diagonally, radiating from the Capitol and the president's house. These avenues bear the names, and point in the direction of the thirteen original states of the Union. The finest is the Pennsylvania Avenue, which is 160 feet wide; it extends for about  $\frac{1}{2}$  mile from the Capitol to the president's house, and is lined with handsome public and private buildings.

Washington is the ordinary abode of the presidents—whose official residence is generally called the "White House"—and of the foreign ambassadors. The city plot, or ground plan, extends  $4\frac{1}{2}$  miles from north-west to south-east, and about  $2\frac{1}{2}$  miles from north-east to south-west, covering an area of 10 square miles, but as yet only a portion of this is built upon. The parks, squares, and

other open spaces are numerous and extensive. Many of them contain statues of celebrated Americans. The streets are distinguished by letters: the one immediately north of the Capitol being called "A Street North," that to the south "A Street South," and so on through the alphabet. The others, intersecting these at right angles, are distinguished by numbers: the first east of the Capitol being "1st Street East," the first to the west "1st Street West," and so on. The ground taken up by streets is greater than that devoted to buildings; most of the former being of enormous width. Many of the spaces at the intersections of the avenues and roads have been inclosed and planted, and are thus very ornamental.

The city is supplied with abundance of water by an aqueduct opened in 1863, from the Falls of the Potomac, 18 miles distant. One of the bridges for this aqueduct is a beautiful piece of architecture, being of white marble with a single arch of 220 feet span—the largest in the world.

The most important of the public buildings of Washington is the Capitol, or House of Congress, which stands on a gentle elevation in the centre of the city, and is probably the finest structure in the New World. It was commenced in 1792—Washington laying the foundation stone—destroyed by the British in 1814, rebuilt in 1825, and extended in 1851. The original building is of freestone, but the two spacious wings added in the last-mentioned year are of pure white marble. There is a lofty dome in the centre, and two smaller ones at the side. The original Capitol is 352 feet long by 121 feet in depth; but by the addition of the two wings (each 238 feet by 140 feet, and connected by corridors 44 feet long) the whole building is now 737 feet long, and covers an area of  $3\frac{1}{2}$  acres. On the eastern side there are three grand porticoes of Corinthian columns in marble; the western front, which commands the finest view in Washington, projects 83 feet, including the steps, and is embellished with a recessed portico of ten columns. In the centre is the Rotunda, a circular room 96 feet in diameter and 96 feet high. The dome which surmounts it is of iron, and upon the top is a bronze statue of Liberty, 287 feet above the basement. In the northern extension is the Senate Chamber, and in the southern one the House of Representatives, both similarly constructed of iron, with flat ceilings; and though more convenient for members and spectators, they are far inferior in architectural beauty to the old halls, the domed ceilings and columns of which were, however, thought to interfere with their acoustic properties. The Senate Chamber, which is 112 feet by 82 feet, contains galleries for 1000 spectators. The Hall of Representatives is 139 feet by 93 feet, and has a gallery capable of accommodating 1200 persons. Within the Capitol are also included the Supreme Court of the United States, in the old Senate Chamber; the library of Congress, containing over 550,000 volumes and documents; a law library in the old courtroom, and numerous reception, committee, and retiring rooms. The Rotunda is filled with historical paintings by Trumbull, Vanderlyn, and other national artists; and the entire building is richly ornamented, and adorned with fine groups of statuary, frescos, and beautiful marbles. The old Hall of Representatives is still considered the handsomest room in the edifice, and is now used as a National Memorial Hall. The grounds around the Capitol are laid out in walks, and ornamented with shrubs and trees: the part immediately in front of the building being a botanic garden. The president's house, which is inclosed in a small park,  $\frac{1}{2}$  mile north-west from the Capitol, is a handsome structure of freestone, painted white, from which it is called the "White House." Near it are the treasury, army and navy offices, the General Post-office, and the Patent Office. The building devoted to the Treasury and State departments is of an immense size, containing about 500 rooms, besides a large engraving and printing establishment. The



State Army and Navy departments building is a granite structure, 567 feet long by 471 broad. The General Post-office is a fine structure of white marble, 204 feet long, and 102 deep. The Patent Office is an elegant structure, and covers an entire square. Its saloons, 1300 feet in length, are filled with models of every machine or invention that has been patented. A building for the department of agriculture was opened in 1868. It contains a museum in which are specimens of the animals, insects, fruits, and products of the soil from every part of the United States.

Washington also contains a city hall, several theatres, an extensive government asylum for the insane of the district of Columbia and the army and navy (which is surrounded by a large farm), an arsenal, navy yard, military asylum, six banks, numerous hotels, hospital, penitentiary, &c. There are numerous places of worship in the city, including Catholic, Episcopal, Baptist, Methodist, Lutheran, Presbyterian, Unitarian churches and chapels, Friends' Meeting-house, a Jewish synagogue, and several for coloured congregations. Trinity Episcopal Church, in the Gothic style, is one of the finest ecclesiastical buildings. The educational establishments include Roman Catholic and Baptist colleges, a flourishing national medical college, established in 1823; the Columbia College, incorporated in 1821; the Howard University, chiefly used by men of colour; public schools in every ward, and a large number of academies. On the banks of the Potomac, south-west of the president's house, is the national observatory, which is well supplied with good instruments. Near the Capitol, and in the midst of an extensive park, stands a fine building called the Smithsonian Institution, from its having been endowed by James Smithson, Esq., an Englishman, who left £100,000 to the United States "to found at Washington an establishment for the increase and diffusion of knowledge among men." It is 450 feet long by 140 wide, is built of red sandstone, in the Romanesque or Norman style, and embellished by nine picturesque towers from 75 to 150 feet in height. In the building is a museum for objects of natural history, one of the best supplied laboratories in the United States, a gallery for paintings and statuary, and a room capable of containing 100,000 volumes.

Owing to its comparatively recent origin, the objects of antiquarian interest are few. In the museum may be seen the printing press at which Franklin worked; and in the same room is preserved the "Declaration of Independence." Fifteen miles to the south, on the Potomac, is Mount Vernon, once the home, and now the tomb, of Washington. Cenotaphs are erected in the Congressional burying-ground, which is situated about a mile east of the Capitol, to all members of Congress dying while in office. On the angle between the president's house and the Capitol, a colossal monument of Washington was commenced in 1848. It was to be erected by the voluntary contributions of the people, and was intended to be an obelisk of white marble, about 600 feet high; but when it was completed to 174 feet the work ceased, and in 1876 it was determined to complete it as a plain obelisk 470 feet high, and 70 feet square at the base. This structure is surrounded with well-arranged grounds; indeed, the Capitol, the Smithsonian Institute, and the Washington monument, may all be said to be included in one vast park.

The district of Columbia, in which Washington is included, comprises a circuit of 60 square miles, and is under the immediate jurisdiction of Congress. The city itself, in regard to municipal matters, is governed by a mayor and common council, elected by the people; but the citizens have no other franchise—a provision adopted in order to prevent its being the subject of periodical election excitements. The inhabitants carry on an extensive retail trade, and some of them manufacture metallic goods and glass; but the adjacent ports of George Town and Alexandria absorb most of the foreign trade. The navy yard,

which is inclosed by a wall, and covers about 20 acres, is one of the most extensive in the Union. The arsenal, at the junction of the East branch with the Potomac, about a mile from the navy yard, is also one of the principal arsenals of construction in the United States.

The Act for making Washington the capital of the country was passed in July, 1790, and in 1800 the government was removed thither. The population at that time was only 3210. In 1814 the city was taken by the British, when the Capitol, president's house, and library of Congress were either wholly destroyed or greatly injured by fire, and other public works defaced.

**WASHINGTON, GEORGE**, the first President of the United States, was born 22nd February, 1732, at his father's house on the Potomac River, Westmoreland County, Virginia. The English genealogy of the family from which he came has not been satisfactorily traced, but his great-grandfather, John Washington, was an English loyalist who emigrated to America during the period of Cromwell's supremacy. The father of George Washington, Augustine Washington, died in 1743, leaving a large landed property to his widow and five children. George received only the education of the schools of the neighbourhood, and his instruction at them did not go beyond reading, writing, and arithmetic, with the addition, which must have been somewhat exceptional, of bookkeeping and surveying. He paid some attention at a later period to French, but never attempted to speak or write it. As a youth he was remarkable for his early development of physical strength, and he became a leader in all the athletic sports and exercises of his companions. This bodily vigour he retained through life, and to its close he possessed a spare agile frame, capable of much physical endurance, unusual strength in the arms, and the ability to ride with boldness and grace. When he was fourteen years old he was desirous of entering upon a naval career, and a midshipman's warrant was obtained for him, but at the last moment his mother, a lady of vigorous character and masculine will, interposed, and the design was abandoned. After leaving school he continued his studies in surveying until he attained great proficiency, and making it his profession, he received at the age of sixteen a commission as public surveyor, and during the next three years he was employed in this capacity by Lord Fairfax, who possessed vast estates in Virginia. At the time he attained his nineteenth year the frontiers of Virginia were threatened with Indian depredations and French encroachments, and in anticipation of an Indian war, combined with a rupture with France, the government of the colony divided the province into military districts, to each of which an adjutant-general, with the rank of major, was appointed. George Washington was commissioned to one of these districts, but did not then take part in any active service. In the same year he accompanied his brother Lawrence in a voyage to Barbadoes, and during his stay there he was attacked with small-pox, by which he was slightly marked through life. This was the only occasion on which Washington left American soil, and his stay in Barbadoes lasted only a few months, at the close of which he returned to Virginia. His brother Lawrence died in the summer of 1752, leaving an infant daughter, who did not long survive him, and his estate of Mount Vernon on the Potomac became the possession of George, and was ever afterwards his family residence. On the arrival of Dinwiddie as colonial governor, the military establishment was reorganized, and the province was divided into four districts, of which the northern, including several counties, was assigned to Washington as adjutant-general. The struggle of the French and British for the possession of the North American continent was the great event of the middle of the eighteenth century, and at this period the French government had formed a scheme for connecting their possessions in Canada and Louisiana

by a chain of forts along the Ohio valley, so as to effectually check the westward progress of British colonization. This project excited much alarm among the British colonists, and Dinwiddie despatched Washington on a special mission to the French commandant. He started on his difficult and dangerous journey in November, 1753, and on his return his journal was sent to England to enlighten the government there as to the measures taken by the French. Dinwiddie also convened the assembly of the colonies, and informed them of what was taking place, with the result that a military force was raised to act against the French, and Washington was placed in command of a small expedition designed to hold them in check. He was successful in his first engagement, but later in the year he was besieged in a fort he had constructed at the junction of the Alleghany and Monongahela rivers, and forced to capitulate on honourable terms. In 1755 he joined the force under General Braddock as a volunteer, and he was present at the disastrous defeat of that commander on the Monongahela, 9th July, 1755, when Braddock and most of his army were killed, and Washington, who had four bullets through his coat and two horses shot under him, was the only officer unwounded. After this disastrous event a force of 2000 men was raised for the protection of the frontier by the assembly, of which the chief command was conferred on Washington. The years 1756 and 1757 passed without any important military event in the southern department, but in 1758 Washington held the chief command of the Virginian contingent in the ill-conducted and abortive campaign against Fort Duquesne. On 17th January, 1759, he married Mrs. Martha Custis, the wealthy widow of John Parke Custis, a lady of the same age as himself, comely and amiable, and who owned a large property contiguous to his own. About the same time he took advantage of the expulsion of the French from the Ohio valley to resign his commission, and during the next fifteen years he devoted himself to the cultivation of his own and his wife's estates. The staple products of his plantations were tobacco and wheat, and the management of his estate partook somewhat of the nature of commerce as well as agriculture, inasmuch as he shipped his surplus crops to England and imported English manufactures in exchange. In the conduct of his affairs he was rigidly methodical and exact, and his books, farm accounts, and letters which are still extant afford unquestionable evidence of his business capacity. He was accustomed to spend the summer of each year at Mount Vernon, but the winters, owing to his duties as a member of the provincial assembly, were for the most part passed in Williamsburg. In common with the rest of the Virginian planters of his day, he was a large slaveholder, but his correspondence shows that though a strict, he was also a just and considerate master, and during the latter portion of his life at any rate he became strongly averse to the institution of slavery. Proof of this is afforded by the fact that in his will he made provision for the emancipation of all his slaves on the decease of his wife, and also for their support and education.

On the outbreak of the Revolution the traditions of his family, his military education, his great stake as a holder of property, and his habitual respect for all lawful authority and for, in common with all others of his class, to deprecate a rupture with the mother country; but the moment it became evident that the connection could be kept up only by the sacrifice of the principle that representation and taxation should go hand in hand, he placed himself in the front rank of the patriots. On 19th April, 1775, the appeal to arms was made at Lexington and Concord, and on the 15th June following the Continental Congress unanimously elected George Washington commander-in-chief of the armies of the Revolution. The war was conducted by Washington under every possible disadvantage.

He had no personal experience in the handling of large bodies of men, and this was equally the case with all his subordinates. The Continental Congress, under whose authority the war was waged, had no legal right to enforce taxation or compel the obedience of the individual. The country was nearly as destitute of the *matériel* of war as of the means of procuring it, having neither arsenals, forts, navy, foundries, means, nor credit. The British government, on the other hand, had all the prestige of an ancient monarchy, of legitimate authority, of disciplined forces, of a powerful navy, of the possession of most of the large towns, and the machinery of government for peace and war. Nor was it without the sympathy of a considerable portion of the people, especially of the wealthy class. That Washington, carrying on the war under these circumstances, met with frequent reverses, and that the progress of the Revolution as conducted by him seemed often languid and inert, is less wonderful than that he rose superior to such obstacles, and was able with unexhausted patience and matchless skill, to bring the contest eventually to an auspicious and honourable close.

With respect to the events of the campaign which followed, he took command of the forces besieging Boston on 3rd July, 1775, and though his army languished under indiscipline, home-sickness, inoculation for small-pox, and the want of the most necessary stores, he held on until 17th March, 1776, when his perseverance was rewarded by the evacuation of the town by the British. Then followed in rapid succession the defeat of the American General Putnam at Brooklyn, the retreat of Washington from New York and through the Jerseys, during which his army rapidly diminished, and he barely retrieved his fortunes by the brilliant skirmish of Trenton and the more substantial success of Princeton. The latter victory restored the drooping courage of the colonists, but it was followed by the defeat of Brandywine, the unsuccessful blow at Germantown, and the terrible winter at Valley Forge. During the latter winter the fortunes of the colonists seemed to have reached their lowest ebb, and the commander-in-chief needed almost superhuman patience and endurance to maintain his position. His army was destitute of the most necessary stores, his military chest almost empty, his troops mutinous and discontented, and he was hampered and thwarted by cabals and boards of war in Congress, some of the members of which endeavoured, by disgusting him with their meddling, to drive him to resignation. Moreover, his defeats at Brandywine and Germantown contrasted unsatisfactorily in the public mind with the important success of Gates at Saratoga, and his second in command, General Charles Lee, strove secretly with all his might to undermine the popularity of his superior. But through all these trials he held on to his post, and strove to fulfil his duties with a quiet fortitude which amounted to heroism, and which enabled him, in spite of all difficulties, to retain his place in the hearts of the people. In 1778 his courage and skill turned the disgraceful commencement of the day at Monmouth into a substantial victory; but from that time forward no brilliant success attended the forces under his immediate command, until his policy of persistence ended in the delivery of the crushing blow to the power of the British by the united French and American forces at Yorktown on 17th October, 1781. The surrender of Lord Cornwallis decided the issue of the conflict, but the war dragged on a lingering existence for two years longer, and it was only brought to its final close by the evacuation of New York on 25th November, 1783. On 4th December Washington took a solemn farewell of the officers of the army, and on 23rd December, 1783, he resigned his commission to the Continental Congress sitting at Annapolis.

He retired immediately to Mount Vernon and resumed his occupation as a farmer and planter, anxiously shunning

all connection with public life. Much of his time, however, was taken up with a laborious correspondence on the subjects connected with the war, and by the throng of visitors from every part of the Union and of Europe. It soon became evident, moreover, that his country required his services no less in peace than in war, and in the anarchy and confusion which followed the accomplishment of the Revolution, it was to Washington that men turned for light and guidance. In 1787 he was a member of the Convention which met at Philadelphia, and being unanimously elected president, he had a large share in drawing up the Constitution of the United States, which came into operation in 1789. Unanimously elected first president of the republic, he took the oath of office 30th April, 1789, John Adams being vice-president, Jefferson secretary of state, Hamilton secretary of the treasury, and Knox secretary for war. In the summer of that year his life was endangered by a malignant carbuncle in the thigh, but the disease was cured after a skilful surgical operation had been performed. During the autumn he made a tour through the Eastern States, and another through the Southern States in the spring of the year following. The session of 1791 produced the laws for apportioning the representatives, establishing a uniform militia system, and increasing the army. Foreign affairs were a source of considerable anxiety at this period, while at home there was much financial trouble and disaster, but in spite of these troubles order was speedily educed by the new administration, guided by Washington's own consummate prudence, and this notwithstanding the existence in the cabinet itself of early-developed elements of discord. In the country itself two great parties were in process of formation, one opposing the formation of a strong central government, known afterwards as the Democratic party, and the other in favour of measures that would give efficiency to the central power, which afterwards took the name of Federalist.

Jefferson was the head of the Democratic section and Hamilton that of the Federalist, and Washington, though he inclined personally towards federalism, exerted all his influence to moderate between the diverging tendencies of his cabinet councillors. As his term of office drew to a close, he intimated his intention of returning to private life, and it was only at the earnest solicitation of personal and political friends of all parties that he consented to be re-elected. He took the new oaths 4th March, 1793.

The first question that came before the cabinet after his re-election rendered more decided the differences which already existed. The European nations, of which the court of St. James and the French Republic were the representatives, were eager to draw the United States into the vortex of their struggle. The president and his cabinet were unanimous in their determination to preserve peace, and the proclamation of neutrality was published 22nd April, 1793. This wise act was bitterly assailed by the partisans of France, but Washington fearlessly avowed his disapproval of the violent proceedings of the Jacobins, and his wish for a peaceable settlement of the differences with Great Britain, and notwithstanding the opposition of the Democratic party, Mr. Jay was sent on a mission to London, and a treaty settling several of the subjects in dispute was negotiated and ratified 8th August, 1795. During the last years of his second administration, however, his popularity, owing to the bitterness of party feeling, greatly declined, and he retired from public life after issuing his farewell address 17th September, 1796. It was his own earnest hope that this retirement would be final, but scarcely a year had elapsed when the long-standing controversy with France threatened to develop into actual war, and Washington was appointed lieutenant-general of the armies of the United States. The storm, however, blew over, and Washington enjoyed for two years the

quiet of his home at Mount Vernon. The beginning of December, 1799, found him in remarkably good health and in the full enjoyment of his physical and mental faculties, but on the 12th of the month, while riding, he was caught in a heavy storm of snow and sleet, and the next day it became evident that he had contracted a severe cold. The disease became gradually more serious during the day, and by the 14th it had developed into acute laryngitis, from which he died the same night. He had been most happy in his domestic relations, but he had no children, and his property was left to his step-children, nephews, and niece. His wife survived him only three years.

In person Washington was tall and well-shaped, with regular features and light blue eyes. He had naturally a strong temper, but he kept it habitually under restraint, and his manner blended courtesy and affability with a quiet but unmistakable dignity. In all the relations of private life he was unexceptionable, and few of the great men of history display a character which comes out so spotless upon close investigation, as that of the hero of American Independence. He was simple, modest, patriotic, and he served his country with an energy, patience, and perseverance, equalled only by his disinterestedness. To all the other traits of excellence in his character he added profound convictions of religious truth, firm faith in Divine Providence, and reverence for the Christian Church, of which he was a communicating member.

See "The Writings of George Washington, with Life," by Jared Sparks (twelve vols. 8vo, Boston 1831-37); the "Life of George Washington," by Chief-Justice Marshall (five vols. 8vo, Philadelphia, 1805, new edition in two vols. 1832); and the Lives written by Washington Irving, David Ramsey, James K. Paulding, C. W. Upman, and others.

**WASHINGTON LAND**, the name given to an extensive desolate tract on the west side of Greenland, bordering on Kennedy Channel, Smith Sound, between 80° and 81° N. lat.

**WASHINGTON, TERRITORY OF**, occupies the extreme north-west of the domain of the United States of America. It is bounded on the N. by British Columbia and the Straits of Juan de Fuca (which separate it from Vancouver's Island), on the E. by Dakota, on the S. by Idaho and Oregon, the winding river forming the boundary, and on the W. by the Pacific Ocean. It is about 360 miles in its greatest length, from east to west, and 235 miles in width, from north to south. Its form is nearly a parallelogram. The area is 66,880 square miles; and the population in 1880 was 75,116. In 1870 the number of inhabitants was 23,955.

A large part of the surface is mountainous, being a continuation of the rocky chains in Oregon. The Cascade range extends across the territory in a north and south direction, dividing it into unequal portions, the larger of which is on the eastern side. The principal peaks are Mount Rainier, about 12,300 feet; Mount St. Helen; Mount Adams, about 9500 feet; and Mount Baker, 10,700 feet high. These peaks are covered with perpetual snow. Mount St. Helen and Mount Baker are active volcanoes. Between the Cascade range and the ocean rises the Coast range, the highest peak of which is Mount Olympus, about 8150 feet above the sea. In the south-east part is a range called the Blue Mountains.

The territory is drained by the river Columbia and its affluents, but the navigation of all the streams is obstructed by falls and rapids. The mountain and river scenery is very striking, and considered by some travellers to be the grandest in America. In the interior are numerous lakes, abounding in fish. The Straits of San Juan de Fuca connect the Pacific Ocean with Puget's Sound, a large bay from 1 to 4 miles wide, which penetrates nearly 100 miles into the heart of the country, and forms one of the best harbours in America.

It is in the immediate neighbourhood of what are now the best whaling grounds in the Pacific, and is navigable for the largest ships, which may anchor close to the shore.

The territory possesses a varied soil, but is generally well watered, densely wooded, and very fertile, especially on the lowlands along the rivers. Only a small portion has yet been brought under cultivation, but wheat, barley, oats, potatoes, and the hardier fruits are produced in abundance. Among the trees is the same species of gigantic fir which is found in Oregon and California, attaining a height of nearly 300 feet, and from 8 to 12 feet in diameter. The forests around Puget Sound comprise yellow fir, cedar, maple, oak, ash, spruce, hemlock, and alder, all very large. The wooded districts abound in game and wild animals; among the latter are the elk, deer, bear, fox, otter, beaver, musk-rat, and rabbit; and the birds include swans, geese, brant, gulls, ducks, eagles, grouse, pheasants, partridges, woodcocks, hawks, ravens, and robins. Fish are very plentiful, especially in Puget Sound and the adjoining waters. Cod, mackerel, sardines, halibut, herring, and flounders, and the oyster, crab, clam, lobster, and many other species are found. The salmon resort to the Columbia and its tributaries in immense shoals.

Extensive mines of coal occur in many places, accompanied by the new red sand-stone (valuable for building); and rich veins of gold have been found in the north-east.

The climate in the west of the territory is very similar to that of England; but to the east of the mountain extremes of both heat and cold are experienced. The capital town is Olympia.

The district was first discovered by Juan de Fuca, a Greek, in 1592. In 1775 it was visited by some Spanish navigators; three years afterwards by Captain Cook, and subsequently by Vancouver and others. It was first settled by the Hudson Bay Company in 1828; in 1818 the Americans entered the country, then part of Oregon; and the discovery of gold diggings at Fraser River in 1858 attracted thither 15,000 persons, many of whom became permanent residents. It was made an independent territory in March, 1853.

**WASP** (Vespidæ) is an extensive family of insects of the order HYMENOPTERA. The wasps are distinguished from all the other Hymenoptera by having their forewings folded longitudinally throughout their entire length in repose. In their general appearance they resemble bees, but are more slender and naked, or only slightly hairy; the colour is usually black with yellow markings. The prothorax is prolonged backwards to the base of the wings. The abdomen of the female is furnished with a long venomous sting. The eyes are kidney-shaped, and extend nearly to the base of the mandibles, which are well-developed and prominent; the maxillæ are long and compressed. Wasps are divided into two groups, according as they are solitary or social in their habits.

The social wasps, which contain the commonest and best known species of the family, live in communities composed of females, males, and neuters or workers, which are undeveloped females. Their nests are placed either in holes in the ground, in hollow trees, or are attached to walls, the branches of trees, &c. They consist of cells which are constructed of a substance like rough paper or pasteboard, composed of woody fibre reduced to a pulp by the secretion of the salivary glands. The whole nest, in temperate countries at least, originates from a single female, who has passed the winter in a torpid state and comes forth in early spring to found a community. The female of the Common Wasp (*Vespa vulgaris*) first seeks a hole in a suitable situation and enlarges it to form a subterranean chamber for the future nest. A few cup-shaped cells are then constructed, and an egg deposited in each. As soon as the eggs are hatched the parent wasp supplies the larva with food, which consists partly of honey

and partly of fruits, &c. The larvæ pass quickly through the pupal state, and then emerge as neuters, which assist the female in the enlargement of the nest. The female continues to lay eggs, and towards the end of summer perfect females, and then males, are produced.

The community of wasps and their nest are called a vespiary. There are several hundred females in one of these settlements, few of which survive the winter. The survivors fly about in spring actively engaged in preparations for their future colonies. Once established, they never quit the nest. The males and females quit the nest for the nuptial flight about October. The males are about equal in number with the females. Their habits are industrious, and not, like those of drones, luxurious and lazy. They carry off the rubbish and the bodies of the dead, which, if too heavy for their strength, they quarter and carry away piecemeal. Their lives are peaceful, and they die a natural death at the close of the year, when the cold destroys both them and the workers. The neuters are the most numerous and the busiest class of the vespine community. They are its architects, soldiers, and commissaries. They build, gather provisions, regulate the nurseries, and revenge insults. They ramble everywhere with impunity, and all provisions are to their taste. The worker having brought home his spoil, perches on the top of the nest amid his assembled compatriots, and disgorging the sweets he has collected, fairly distributes them. When not occupied on foraging expeditious, the neuters are employed in the enlargement and repair of the nest. Celerity and order prevail in all their operations. Each of the masons has his allotted space, an inch or an inch and a half in extent, wherein he conducts his plastering operations, his mouth serving as a hod, carrying a ball of ligneous fibre, previously torn by his powerful jaws from gateposts, wood-blocks, and neighbouring trees. This fibre, kneaded together and moistened with saliva, is made into a paper, of which are constructed the combs, each made up of a number of hexagonal cells opening downwards. The outside of the whole nest is coated with foliaceous layers. The cells of the comb of the common English wasp are brown, and coarse in texture; but where the larvæ have spun their cocoons, they are lined with a white and semi-transparent paper, fashioned on the mould of the cell, and probably made by the larvæ themselves. The larvæ that remain in the nest after the males and females have quitted it at the end of autumn are, by a singular instinct, removed from the nest by the workers and left to die. Wasps are fond of honey, but obtain it by plundering the bee-hives, or attacking the bees. They feed indiscriminately on a great variety of vegetable and animal substances, such as succulent fruits, sugar, insects, &c.

The common wasp of Britain is *Vespa vulgaris*, which makes its nest in the ground. Several other British species of *Vespa* attach their nests to the branches of trees, as the Wood Wasp (*Vespa sylvestris*). The largest British species is the HORNET (*Vespa crabro*), which usually builds in the hollow of a tree. Other social wasps belong to the genera *Polybia*, *Polistes*, &c.

The solitary wasps form a group, Eumenides, sometimes considered as a distinct family. They are generally smaller than the social wasps, consist only of males and perfect females, and have toothed or bifid claws to the tarsi. Of the typical genus *Eumenes*, only one species is British. This is *Eumenes coarctatus*, found locally in the south of England, which constructs small globular cells of mud, attached to twigs of shrubs, walls, &c. The nests are furnished with a store of small green insect-larvæ for the sustenance of the young of the wasp. The Wall Wasp (*Odynerus parietum*) is a common British species, making its nest, which it stores with the larvæ of beetles, butterflies, and moths, in walls and claybanks. Several other species of the same genus are British.

**WAS'SAIL**, the name of a festive song, of Saxon origin, which was sung in the middle ages from door to door, about the time of Epiphany. The Wassail Bowl was the name of a large silver cup or bowl, in which our Saxon ancestors at their festivals drank healths to one another, agreeably to the old Saxon phrase *Waeshael*, "health to you." The special time for wassailing was New Year's eve and New Year's night.

**WAT TYLER.** See *Peasant Revolt* (under Richard II.) in the article *PEASANT WAR*.

**WATCH.** See *HOROLOGICAL*.

**WATCH**, among seamen, is the period of time occupied by each part of a ship's crew alternately while on duty. The period of time called a *watch* is four hours, the reckoning beginning at noon or midnight. Between four and eight p.m. the time is divided into two short or *dog-watches*, in order to prevent the constant recurrence of the same portion of the crew keeping the watch during the same hours. Thus the period from twelve to four p.m. is called the afternoon watch, from four to six the first dog-watch, from six to eight the second dog-watch, from eight to twelve the first night watch, from twelve to four a.m. the middle watch, from four to eight the morning watch, and from eight to twelve at noon the forenoon watch. When this alternation of watches is kept up during the twenty-hours it is termed having *watch and watch*, in distinction from keeping all hands at work during one or more watches.

**WAT'COMBE CLAY**, a bed in the TRIASSIC FORMATION, worked near Watcombe, in Devonshire, for the manufacture of terra-cotta pottery.

**WATER** (symbol,  $H_2O$ ; equivalent, 18; specific gravity, 1) is, in a state of purity, a clear, transparent, colourless, and inodorous liquid, which, at different degrees of heat and cold, undergoes surprising transformations. At a temperature above 212 degrees it evaporates in steam, which, contrasted with air at the same temperature, has a specific gravity of 0.625. In this vapourized condition it consists of two parts of hydrogen and one of oxygen. [See *STEAM*.] At a temperature below 32 degrees it freezes, passing into a hard and solid mass of crystals, whose forms are all referable to the six-sided prism and the rhombohedron. [See *ICE*.] But though water gradually dilates below 39 degrees, its refractive power on light continues to increase.

Its density at 60 degrees, and at the sea-level, is represented by unity, or 1.000, and taken as the standard of comparison for all solids and liquids, just as hydrogen serves as a standard for gases and vapours. Distilled water is 815 times heavier than air, and a cubic inch

weighs, in air at 62° Fahr., and with the barometer at 30 inches, 252.158 grains, and *in vacuo* 252.722 grains, the grain =  $\frac{1}{7000}$  of the pound avoirdupois.

Water was formerly considered to be an element which could be converted into certain organic substances, and this opinion held its ground until near the close of the last century, when Cavendish, by a series of ingenious experiments in the year 1781, demonstrated its chemical composition. He came to the conclusion that water consisted of dephlogisticated air (or oxygen) united with phlogiston (or hydrogen), and a similar conclusion was arrived at by James Watt, and by the French chemist Lavoisier. The attention of the former was directed to the subject by the account of Cavendish's experiments, which he received from Dr. Priestley, and the latter was stimulated by a similar account derived from Dr. Blagden. Attempts have most ungenerously been made to deprive Cavendish of the honour of his discovery, and fix it either upon the Frenchman or the Scotchman. But Dr. George Wilson, in his "Life of Cavendish," and Dr. Whewell, in his "Inductive Sciences," have successfully controverted these claims, and proved that all the credit should fairly be given to the great English philosopher.

Water is an extraordinary solvent, and owing to its capacity of absorption is never found absolutely pure in nature. By the application of heat this property is often greatly augmented, so that a hot aqueous saturated solution of a salt, if allowed to cool, will deposit a portion of the salt in a crystalline form, in which the water enters in combination. It dissolves a vast variety of material, from the hard rock to the elastic gas, and there are few of the products of nature which can resist the continuous action of the liquid.

All natural water therefore is more or less impure; that is, contains more or less of foreign matters. These foreign matters may be either gases, mechanical, mineral, or organic, and one or the other class will predominate according to the locality in which it is found. The purest form of water is rain water, after a continuance of wet weather, when the atmosphere has been thoroughly cleansed; but even under such circumstances it will be charged with the atmospheric gases, oxygen, nitrogen, and carbonic acid. In 100 parts of water will be found from 1.85 to 2.33 parts of air. After thunderstorms it has been ascertained to be charged with a small but perceptible proportion of nitrate of ammonia, due to frequent discharges of electricity through moist air.

The following table shows the solid constituents in 100,000 parts of various waters supplied to towns in the United Kingdom:—

WATER SUPPLY: SOLID CONSTITUENTS IN EVERY 100,000 GALLONS.

	LONDON.				Farnham (Surrey).	Welford (Hertfordshire).	Liverpool (Lancashire).	Glasgow (Scotland).	Glasgow, Water obtained from Loch Katrine.	
	New River Company.	East London Company.	Kent Water Company.	Thames Ditton and Grand Junction Co.						
Carbonate of lime, . . . .	11.17	14.51	10.03	16.84	0.33	2.304	1.98	1.21	Peroxide of iron, . .	0.343
Sulphate of lime, . . . .	4.61	3.33	15.76	4.37	1.87	—	1.43	0.17	Lime, . . . . .	0.731
Nitrate of lime, . . . .	0.03	1.03	0.10	0.39	Trace.	0.33	—	—	Magnesia, . . . . .	0.219
Carbonate of magnesia, . .	1.56	2.16	4.88	1.81	0.91	1.07	0.16	—	Potash, . . . . .	0.043
Sulphate of magnesia, . .	—	—	—	—	—	—	—	0.46	Soda, . . . . .	0.320
Chloride of sodium, . . .	2.47	2.51	5.00	1.57	1.33	1.44	2.23	0.96	Chloride of sodium, .	0.017
Sulphate of soda, . . . .	2.13	1.34	—	—	0.10	1.87	—	—	Sulphuric acid, . . .	0.660
Chloride of potassium, . .	—	—	—	0.96	—	—	—	—	Phosphoric acid, . .	Trace.
Sulphate of potash, . . . .	1.58	1.79	1.00	0.24	0.61	0.63	—	—	Carbonic acid, . . .	0.362
Iron, Alumina, Phosphates, Silica, . . . . .	Trace.	0.67	Trace.	0.13	1.26	—	0.34	0.11	Silicic acid, . . . .	0.176
Organic and other volatile matter, . . . . .	0.71	0.89	1.08	0.89	1.41	2.27	0.21	0.20	Organic and other volatile matter, .	0.071
	0.98	1.02	1.65	1.54	2.54	1.80	2.00	2.60		3.142
	25.24	29.85	30.50	28.74	10.36	32.45	7.45	5.71		

The variety of water second in point of purity to rain water is that of some mountain torrents and rock-bound lakes, where the soil is not easily absorbed, and the only soluble matters are those washed down by the copious rains. Then comes the water of certain springs and streams, but the degree of purity is always to be measured by the conditions under which the water exists.

In all cases it may be purified by distillation, rejecting the first and last portions which pass over—the first, on account of the gaseous impurities; the last, because these are necessarily polluted by the saline bodies originally dissolved.

The mineral, mechanical, or suspended impurities are those which arise from the passage of the water through or over the earth, and consist of soil, clay, chalk, sand, silica, and other absolutely insoluble compounds. These will be more or less injurious according to their character, and will not only affect the purity, but the nature of the water, rendering it "hard" or "soft" as the case may be. Though in a certain sense impurities, because foreign bodies, they sometimes operate as filtering materials. Thus water which percolates through sand will be divested by this medium of all suspended impurities.

By organic impurities we mean animal and vegetable organisms, either living or dead, and all kinds of animal and vegetable refuse. Their presence may be detected by the colour and smell of the water, or by chemical analysis, and if allowed to decompose they render it not only unpleasant and deleterious, but even fatal to animal life. The public are not sufficiently aware of the vast importance of pure water to human health. Many of the epidemic diseases which work such havoc in our cities and towns are almost wholly due to the bad water drunk by their inhabitants. Recent investigations have shown how intimately the spread of typhoid fever is connected with this subject, and have demonstrated beyond all doubt or contradiction that its ravages are not to be apprehended in districts where the water supply is of a wholesome character, and is reasonably free from organic impurities. Much therefore may be learnt from the preceding table.

With respect to gaseous impurities, it is only necessary to observe that their presence in water wholly depends upon the conditions of its locality. But the waters of some springs, owing to the strata through which they pass, contain large quantities of gases—as Harrogate, those of which contain sulphuretted hydrogen.

Mineral or saline impurities are of the most varied description, and are dissolved by water in its passage through the earth or over its surface. These may be carbonate of lime, carbonate of magnesia, and salts of potash, soda, and alumina, each being found in varying proportions, according to the nature of the soil. The greater proportion of the substances found in water are of a mineral character. Where iron is present the water is said to be chalybeate. "Hard" water is produced by the presence of the salts of magnesia and lime.

The analysis of potable water is an operation of considerable delicacy and of great importance, as it is quite impossible to tell from the appearance or taste of a well water whether or not it is wholesome for drinking. The water of a shallow well is often particularly bright and sparkling, and yet may be deadly in its effects on the human system.

The microbes of disease, when present in water, are so minute that they pass easily through all ordinary filters. According to Pasteur unglazed biscuit porcelain alone resists their transit, and this filter is so slow, even under considerable pressure, as to be useless on the large scale. The source of the water supply of a town therefore must be above suspicion.

Unfortunately there is no known means of chemical analysis which will identify the particular kind of organic matter which may be dangerous. A peaty water, con-

taining much organic matter of a vegetable origin, may be innocuous, whereas another water containing a very minute trace of organic matter, derived from an animal contamination, may be very dangerous.

A good idea of the amount of organic matter present may be afforded by mixing the water with permanganate of potassium, and ascertaining the amount of water required to decolorize it; this gives the quantity of oxygen necessary to oxidize the organic matter. The colour of the water, when seen through a 4-foot tube, is also a good indication; it ought to be blue if pure, as distilled water.

The hardness of the water may be easily determined by shaking it with standard alcoholic solution of soap, and estimating the amount expended in producing a lather. This gives an accurate estimate of the lime and magnesia salts present. The carbonates of these earths are thrown down by boiling; the sulphates and chlorides are not, and these constitute what is called the permanent hardness of the water. These salts are estimated by repeating the soap test after boiling.

The amount of soap daily wasted in towns supplied with hard water is enormous, and sometimes amounts to a heavy water-rate of itself, as the whole of the lime and magnesia present must be precipitated in combination with the soap before anything can be washed. In some towns the water is treated with lime, which precipitates the carbonates of lime and magnesia, by neutralizing the free carbonic acid in which these alkaline earths are dissolved. The disadvantage of this process is, that great care is necessary to avoid excess of lime, and the water is deprived of its sparkling character, and becomes flat and insipid. The organic matter may be partially removed from water by filtration through animal charcoal, which also separates many other foreign bodies, even the poisonous alkaloids. This filter requires frequent renewal, as after a time it may impart impurity to the water instead of retaining it. The same remark applies to all filtering media. With charcoal, however, it can be easily purified by recarbonization, or what is technically known as reburning it. The presence of sulphate of lime or gypsum in water improves it for brewing purposes, but renders it useless for boiling some albuminous vegetables, such as peas, beans, and lentils, with which it forms an insoluble compound.

Pure water, as used in medicine and in the laboratory, must always be distilled; and even then, such is its powerful solvent properties, that it is extremely difficult to obtain it absolutely pure, or to retain it in that condition. Even glass vessels are not free from its solvent action. It also adheres to glass with great tenacity, and is difficult to remove entirely from its surface. If the glass vessel is chemically clean the adhesion is so great that it is impossible to boil water in it even at a high temperature.

The constantly increasing wants of London, as regards water, were very amply provided for during all the earlier stages of its history by the stores of water contained in the extensive beds of gravel lying in the Thames Valley. These stores of water could be reached by means of shallow wells, and all the ancient and famous London pumps drew their supplies from this source. But as the population of the district increased the value of this source of water-supply became greatly impaired from two causes—(1) the excessive drain upon it, caused by the rapid multiplication of wells; and (2) the pollution of its waters by the refuse-matter of a great city. Hence it became necessary to seek for new sources of water-supply, and the success which had already attended the construction of artesian wells in the tertiary districts of Northern France led to attempts being made to obtain supplies in a similar manner by putting down borings through the impervious London clay into the water-bearing beds of the lower London tertiary. For a time the quantity of water thus obtained, as at Merton, Giarrett, and many other points, seems to have induced the belief



that an inexhaustible source of the all-essential element had been discovered; but the rapid multiplication of these artesian wells soon revealed the fact that the new and valuable stores had their limit, and that this limit was being very rapidly approached in consequence of the excessive demands which were being made upon the new source of supply. It was hoped, however, that if wells could be sunk sufficiently deep to reach the "lower greensand," further very large and valuable supplies of water would be obtained. Accordingly, in 1877 a very spirited endeavour was made by Messrs. Meux & Co., the large brewers of Tottenham Court Road, to tap this subterranean reservoir, but it was unfortunately not attended with the success anticipated, and after attaining a depth of over 1100 feet the borings were discontinued.

An Act was passed in 1871 for providing a constant supply of water in the metropolis. The Act, however, remained practically a dead letter; and a bill was therefore introduced by the home secretary, Mr. Cross, in 1880, for purchasing the property and rights of all the companies, and creating a Water Trust for London and its neighbourhood. The amount proposed to be paid to the companies—£31,000,000—was, however, deemed so exorbitant that the bill was withdrawn.

Sea water contains no less than twenty-seven different elements—namely, chlorine, sulphur, bromine, iodine, carbon, magnesium, sodium, calcium, potassium, iron, fluorine, phosphorus (phosphate of lime), silver, boron (boracic acid), nitrogen (ammonia), silicon or silica, zinc, cobalt, copper, lead, manganese, nickel, aluminium (alumina), strontium or strontia, and barium or baryta. Some of these, however, occur in very minute quantities, and the general composition of the water of the ocean is sufficiently shown in the subjoined table:—

SOLID CONSTITUENTS IN 100,000 PARTS OF SEA WATER.

	British Channel.	Mediterranean.
Chloride of sodium, . . . .	2805.948	2912.1
Chloride of potassium, . . . .	76.552	50.5
Chloride of magnesium, . . . .	366.658	321.9
Bromide of magnesium, . . . .	2.929	55.6
Sulphate of magnesia, . . . .	229.578	247.7
Sulphate of lime, . . . .	110.662	135.7
Carbonate of lime, . . . .	3.301	11.4
Iodine, . . . .	traces.	—
Ammonia, . . . .	traces.	—
Oxide of iron, . . . .	—	0.3
Total, . . . .	3625.628	3765.5
Specific gravity, . . . .	1.0274	1.0258

The saltiness of sea water is a subject which has frequently engaged the attention of philosophical chemists, and it is one which has not been satisfactorily explained. It would seem, however, to have been acquired when our earth was in the act of subsiding from a gaseous state. Its density depends upon its proportion of saline matter, which is generally a little above 3 per cent., though it varies in different places. The ocean contains more salt in the southern than in the northern hemisphere, more in the Atlantic than in the Pacific. In the latter the greatest proportion of salt is found in the parallels of 22° N. lat. and 17° S. lat. It is less near the equator, and least in the Polar seas, from the liquefaction of the ice. Sea-water freezes at 28° 30' Fahr.

Its limpidity is remarkable; it absorbs all the prismatic colours, except that of ultramarine, which, being reflected in every direction, imprints a hue approaching the azure of

the sky. The true tint, when not exposed to atmospheric influence, is always uniform, but it changes its colour in certain localities from the presence of Infusoria, vegetable substances, and minute particles of matter.

**WATER-BEAR** is the common name of some microscopic animals belonging to the class ARACHNIDA, and forming the order Arctisca or Tardigrada. The water-bears or sloth animalcules, as they are also called, are found in moss and damp places, and are very sluggish in their movements. They have an oblong body, with four pairs of short conical limbs, indistinctly three-jointed, and ending in three or four claws. The mouth is suctorial, and contains two styliform protrusible organs. No organs of circulation or respiration can be recognized. The water-bears are hermaphrodite and oviparous, producing very large eggs. Like the Rotifera they have the power of resisting partial desiccation, and when taken apparently quite dried up from the gutter of a house roof they will regain their vitality on being moistened. The order consists of a single family, Macrobiotidae, containing a few species.

**WATERBRASH** or **PYRO'SIS**, is the name given to an affection of the stomach characterized by a severe, spasmodic, burning pain at the pit of the stomach, followed by the eructation of a considerable quantity of watery fluid, resembling saliva, usually insipid and tasteless, but sometimes sourish, and often of a temperature lower than that of the mouth, so as to give the sufferer a sensation of cold. It is more common among the poor than those of higher station, affecting women more than men, and it is found to prevail especially in those parts of Scotland, Wales, and England where the poor live chiefly upon an oatmeal and vegetable diet. The pain generally seizes the patient during the morning when the stomach is empty, and it is often very severe and of such a nature as to enforce a stooping and bent position of the body. After continuing for a time the watery fluid is rejected, and the pain then subsides. Treatment of this disease consists in the removal of all sources of gastric irritation and the use of wholesome, nutritious, and easily digested food. The medicines most efficacious in affording relief are astringents, administered in the intervals between digestion, so as to act upon the mucous membrane. Of these lime-water, bismuth, kino in the form of the compound kino powder of the Pharmacopœia, tannin, and logwood, are all useful; but where the fluid ejected has a distinctly sour taste, perhaps the best remedies are dilute hydrochloric or nitric acid, in doses of twenty drops to a wine-glassful of water, taken half an hour before each meal. In cases where the fluid has an alkaline reaction, and is only thrown up after much nausea and distress, the acid should be taken in the same quantities, but immediately after meals, so as to mingle with the food.

**WATER-BUCK** (*Cervicapra or Kobus ellipsiprymnus*) is a large ANTELOPE abundant in South Africa. It stands upwards of 4 feet high at the shoulder, and is of a grayish-brown colour, with a white elliptical patch on the rump surrounding the tail. The horns of the male are very thick and heavy, about 30 inches in length, directed upwards and outwards, and strongly ringed, except in the last 6 inches of their length. The tail is short and tufted. The female has no horns. It frequents the neighbourhood of rivers in small herds, and usually takes to the water when pursued. The flesh is said to be rank and disagreeable.

**WATER-BUG** is the popular name of the Hydrocorisæ, a section of Heteropterous insects, order HEMIPTERA, which dwell almost entirely in the water, and prey on aquatic insects. Their antennæ are very small and hidden beneath the eyes. Three families are contained in this group, Notonectidæ, Nepidæ, and Galguliidæ, the last being confined to America. The Water Boatman (*Notonecta glauca*) is a common British insect, so called from the singular resemblance to a boat which it presents as it swims back



downwards, with its long hind legs extended on either side like a pair of oars. It is about half an inch long, and has large wings and powerful jaws. Several other British species belong to this family. The Common Water Scorpion (*Nepa cinerea*) is a large flat dingy insect, about an inch long, with a small head, prehensile scorpion-like fore-legs, and the tail furnished with two long bristles, which serve as breathing organs. It is sluggish in its habits, living among mud and aquatic plants. Another British species of water scorpion is *Ranatra linearis*, which has a very elongated body and legs. *Naucoria cimicoides* is another common species of the family, but has a small oval body about half an inch in length. Some of the foreign species attain a size of 3 or 4 inches. The Gulgulidæ are less aquatic, and live chiefly on the banks of rivers and lakes.

**WATERBURY**, a flourishing town of Connecticut, in the United States, situated 17 miles N.N.E. of New Haven, at the junction of the Brook, Mad, and Nangatuck rivers. It has extensive brass and copper works, and manufactures of watches, clocks, gilt buttons, and silver-plated wares. It has numerous churches, a city hall, and a public library. The population in 1880 was 17,806.

**WATER-COLOUR PAINTING.** As has been said in the article PAINTING, water-colour is the far more ancient form of the art. Fresco, such as was practised by the ancient Egyptians, has left us records coeval with Moses, and many Egyptian specimens, still quite brilliant, are to be seen in the National Gallery. Therefore the discussion as to the permanency of water-colours which occupied the art-world in 1886 was absurdly beside the mark. Indeed, in the face of the perpetual repairs to which oil-pictures are subjected, it required some audacity to raise the question, for if water colours be kept from direct sunlight there is not the slightest doubt that they are immeasurably more durable than oil-paintings. Perhaps Turner is hardly a fair example to choose, because he was always venturesome in method; but it is most instructive to view the unimpaired delicacy of his gem-like water-colours in contrast with the wrecks which are all that are left of some of his most famous oil-paintings. An authoritative letter from Ruskin closed the discussion, and raised the point of the true dignity of water-colour painting so finely that two paragraphs may be here quoted:—

"Pure old water-colour painting, on pure old paper, made of honest old rags.

"There is no china painting, no glass painting, no tempera, no fresco, no oil, wax, varnish, or twenty-chimney-power-extract-of-everything painting which can compare with the quiet and tender virtue of water-colour in its proper use and place. There is nothing that obeys the artist's hand so exquisitely; nothing that records the subtlest pleasures of sight so perfectly. All the splendours of the prism and the jewel are vulgar and few compared to the subdued blending of infinite opalescence in finely imbedded water-colour; and the repose of light obtainable by its transparent tints, and absolutely right forms to be rendered by practised use of its opaque ones, are beyond rivalry, even by the most skilful methods in other media. Properly taken care of—a well-educated man takes care also of his books and furniture—a water-colour drawing is safe for centuries; out of direct sunlight, it will show no failing on your room wall till you need it no more; and even though, in the ordinary sense of property, it may seem less valuable to your heir, is it for your heir that you buy your horses or lay out your garden? We may wisely spend our money for true pleasure."

The dangers from damp by the absorptive nature of the paper, and from chemical action by the use of inferior paper, are the chief evils special to water-colours. The fugitive nature of certain pigments affects them and oil-paintings able, and no artist in the present state of knowledge is justified in using those pigments.

Though fresco, the oldest form of water-colour painting [see FRESKO], has existed from time immemorial, and still exists, what we technically call by this name is quite a modern art. It is true that tempera and encaustic painting are to a certain extent water-colours, and that the illuminators of the many beautiful manuscripts in what are foolishly called the "dark ages" are in pure water-colour, and also that miniatures were also produced in that medium, but it was not till nearly the close of the last century that it became customary to tint large pencil-drawings with broad washes of colour. The title of "water-colour drawings" thus acquired lasted down to our own day, and is still employed as a technical term in preference to the more correct "paintings."

John Robert Cozens (1752-99), a grandson of Peter the Great, born during his English stay, is the first independent water-colour artist, and pale though his tints are, they are full of suggestive beauty, and sometimes of sombre and romantic effects, and what is technically called "atmosphere." Three excellent works by Cozens are in the gallery at the South Kensington Museum, as are four by his almost equally good comrade Paul Sandby (1732-1809). Others who contributed to lay the foundations of the supremacy which the English water-colour artists have ever held over those of other nations, were William Payne (1730-1800), John Smith (1749-1831), and especially Thomas Girtin (1773-1802), who first aimed at force as well as delicacy, attaining a balance and harmony hitherto unknown. In atmospheric effects he has never been surpassed. Equalled he has been, it is true, and by two men, Turner and Cox. The career of Joseph William Mallord Turner (1775-1851) is elsewhere fully described; it is sufficient to say here that so far as his water-colour paintings are concerned no man has ever so fully united knowledge, imagination, and executive skill. At the National Gallery are some Turner drawings which glow with delicate fires, magically rendering transparent what was once mere opaque paper. In pure art Turner was even excelled by David Cox (1783-1859), who must assuredly rank as our greatest water-colour painter, in fact as the greatest who ever lived. No finer art than that of Cox at his best exists. His works are ideally perfect in breadth and transparency of colour. He has the poetry of Corot without his mannerism, the truth of Constable with the addition of a perfect style. Lovely examples of the master are in the South Kensington Gallery. So nearly equal with Cox in some of his works as to claim rivalry with him is George Barret (1780-1812), who paints with a unity and penetrating truth hardly to be matched. The purity and balance of his best efforts are a delight ever to be remembered by those who have seen them. Peter de Wint (1784-1819), highly original, rather cultivated tone and colour than form, and dashed off wonderfully effective renderings of vast expanses of country, which are now priceless. Anthony Vandyke Copley Fielding (1787-1855) excelled in smooth renderings of the hills (South Downs) and the seas of our south-eastern coasts, while George Fennel Robson (1790-1833) was doing equally admirable work among the lakes and mountain scenery of the north and west of England. John Varley (1778-1842), Joshua Cristall (1767-1847), John Glover (1767-1849), William Howell (1782-1857), J. D. Harding (1798-1863), Edward Duncan (1803-82), John Frederick Lewis (1805-76), George Dodgson (1811-80), and William Muller (1812-45) were other distinguished artists in that brilliant time of water-colour art, in the midst of which Victoria came to the throne. Of special importance are the architectural painters—David Roberts (1796-1864) and James Holland (1800-70)—who treated architecture with a quite peculiar union of lightness and significance, while the work of Samuel Prout (1783-1852) is unique in the history of the art. Prout's Gothic cathedrals of Normandy, and the like,

are among the most exquisitely delicate and picturesque productions that artist ever attempted. There seems little work in the drawing, still less in the colour, but the sense of finish and the inimitable lightness of touch defy description. Some of his most valuable work is at South Kensington. George Catmole (1800-68), a very original and forcible painter of real genius, poured forth marvellously romantic sketches, but rarely finished in detail. William Hunt (1790-1864) ranks among our best English colourists. His subjects are very simple—a bank, a nest with some eggs, a spray of blossom or a little fruit; but the texture, the bloom, the intermixture of tints, &c., were always inimitably rendered. On his own ground Hunt is without a rival. Ruskin's glowing eulogium on Prout and Hunt is not a word too strong. Samuel Palmer (1805-81), the son-in-law of Linnell and the friend of Blake, was a painter of no common order, massive in colour even to excess of power, delighting in sunsets which flame and heath which glow, and as good in etching and in oil-painting as in water-colour. Finally, water-colour art has to mourn the early death of Frederick Walker (1840-75) just as he had found his true dominion, the idealization of our everyday life, or rather the realization of the grace which everywhere lies concealed to the blindness of our eyes, while all too patent to those whose senses are awake. Upon contemporary painters it would not be right to speak; but an exception may be made in favour of Hubert Herkomer, who in these later days has shown water-colourists how, by judicious use of body colour, they can attain the depth and force of oils while still preserving most of their own distinctive excellencies. His portrait of Tennyson, hanging amidst the oil paintings of its year at the Grosvenor Gallery, vied with them in power, while it relapsed them in softness and beauty.

There are two most important societies of painters in water-colours. The "Old Society" is the Royal Society of Painters in Water-Colours, established in 1805, which limits its exhibitors to its own members, and therefore occasioned the formation in 1832 of the "New Society" on less exclusive lines, the proper title of the latter now being the Royal Institute of Painters in Water-Colours. Both societies are in a highly flourishing state, and often number the royal family among their contributors. The Queen accorded them the epithet "royal" in 1882. Earnest attempts were made by the Institute in 1880, when acquiring the spacious site in Piccadilly which its galleries now occupy, to amalgamate the two great societies and to establish schools, prizes, &c., for water-colour, on the model of the schools of the Royal Academy for oil. Unfortunately the exclusiveness of the "Old Society" again asserted itself, and prevented this almost necessary scheme from succeeding. It has become lately the royal custom to confer knighthood on the presidents of both water-colour societies as well as on the president of the Royal Academy.

**WATER-CRESS.** See CRESS.

**WATER-DROPPWORT.** See ENANTHE.

**WATER-FLEA.** See DAPHNIA.

**WATERFORD**, a county in the province of Munster, in Ireland, is bounded S. by St. George's Channel, E. by the estuary called Waterford Harbour, by which it is separated from Wexford, N. by Kilkenny and Tipperary, and W. by Cork. The greatest length east to west is 52 miles; the greatest breadth north to south 28 miles. The area is 724 square miles, or 461,553 acres. The population in 1871 was 122,825, and in 1881 112,768, chiefly Catholics.

The coast-line is bounded W. by Youghal Harbour, E. by Waterford Harbour, and intermediate are Tramore Bay and Dungarvan Harbour. With the exception of Waterford Harbour these inlets are neither safe nor commodious, the coast-line having generally a very inhospitable appearance, and in some parts it is very dangerous. The general character of the surface is mountainous, but towards the

east it is low and marshy. The climate is moist. The great mountain tract called the Knockmeledown Range, which extends from Waterford, on the east coast, to Dingle Bay, on the west comprehends the whole of the county: it is interrupted on a line from Dungarvan to the valley of the Suir, west of Clonmel, by the southern extremity of the great plain that occupies the central part of Ireland. The Comeragh Mountains, to the west of Dungarvan, are among the highest and wildest in the country: the height of Monavallagh is 2598 feet above the sea. The hills contain two varieties of slate: the old transition slate, coloured gray, which is extensively used for roofing, and the newer slate, which rests on the older; the lower portions of its strata consist of alternating beds of brownish-red quartzose conglomerate and coarse red slate. The valleys are occupied by limestone, and there is a clay-slate district, which contains several copper mines, some of which are very productive. Lead and iron mines have also been worked, but with little profit. Marble of several colours, and some of it very beautiful, is quarried near Cappoquin; and potters' clay is found near Dungarvan.

**Rivers.**—The Suir, which rises in Tipperary, after being joined by the Nier, from the Comeragh Mountains, forms the boundary line between Waterford and Tipperary and Kilkenny. The united waters of the Suir and Barrow form the estuary called Waterford Harbour. The river is navigable for large vessels up to Waterford city, and to Carrick-on-Suir, in Tipperary, for those the draught of which does not exceed 11 feet. The Blackwater, which rises in the Kerry Mountains, enters the county on the west, and runs due east to Cappoquin, where it turns southward and discharges itself into Youghal Harbour, after receiving the river Bride about midway. It is navigable for vessels of 100 tons to its confluence with the Bride, and for those of 70 tons as far as Cappoquin.

Waterford is the first dairy county in Ireland, the chief occupations of its population being pasturage and dairy farming. The soil is naturally poor. Most of the sheep are of a large and coarse breed. Great quantities of butter and bacon are exported. There are some cotton and linen manufactures at Portlaw, and the shipping trade is somewhat extensive. Fish abound on the coast. Waterford is divided into eight baronies. It sends two members to Parliament—one for East Waterford and one for West Waterford.

**History and Antiquities.**—The Menapii, a Belgic colony, appear to have been the ancient inhabitants of Waterford and the adjoining county of Wexford. The Desii, from the county of Meath, were a powerful clan at the period of the English invasion, when their importance was nearly destroyed, and the county afterwards became the great stronghold of the English in Ireland. In 1171 Henry II. granted the city of Waterford and the adjacent province to Richard Le Poer, his marshal, and by marriage the estates and honours of his descendants came to the Beresford family, who still retain large possessions in the county. Waterford suffered little during the rebellion in 1798.

Many remains of antiquity are found in the county. At Ardmore is one of the round towers, and there are in several localities interesting and ancient intrenchments, earthworks, barrows, and cromlechs. A large double trench, called by the Irish "the trench of St. Patrick's cow," may be traced for 17 or 18 miles across the Blackwater towards Ardmore. A second trench runs westward from Cappoquin into Cork. At one period there were twenty-four religious establishments existing in Waterford, and the ruins of some of them still remain at Mothill, Dungarvan, Stradbally, and Lismore. The ancient castles and fortified places were also numerous.

**WATERFORD**, a county of a city, municipal and parliamentary borough, and the capital of the county of Waterford, 97 miles S.S.W. from Dublin, with which it is con-

needed by three different lines of railway, is situated on the south side of the Suir, and is connected with its suburb of Terrybank on the north side of the river by a wooden bridge of thirty-nine arches and 832 feet long, which opens in one part to allow vessels to pass. A noble quay with floating stages that rise and fall with the tide extends more than a mile along the bank of the river, from which the town rises gradually. The situation is very fine, and the streets are now generally well built, although a few are still dark, dirty, and mean-looking. The principal public buildings are the Roman Catholic Cathedral, an elegant modern structure; the bishop's palace, which is of hewn stone, with a double front; the Protestant Cathedral, two parish churches, five Roman Catholic chapels, four convents, and five or six places of worship for dissenters. The other public buildings are a court-house, town-hall, custom-house, chamber of commerce, theatre, prison, and district lunatic asylum. There are also a Roman Catholic College, and several good schools and charitable institutions. In the town are some breweries and foundries, and in the neighbourhood are several flour mills.

The harbour of Waterford is formed by the channel of the Suir, from the city to its confluence with the Barrow, and from thence by the joint estuary of these rivers to the sea, a distance of 15 miles. The entrance, which is  $2\frac{1}{2}$  miles wide, is well lighted by a light on Hook Tower, 139 feet above the sea, by a red light on Dunmore pier, 46 feet high, and two leading lights at Duncannon. Vessels of 2000 tons can discharge at the quays. The navigation is continued on the Suir by barges to Clonmel, and on the Barrow by sailing vessels to New Ross, and thence by barges up that river to Athy, and up the Nore to Inistiogue. On the Kilkenny side of the river there is a shipbuilding yard, with patent slip, graving bank and dock.

The exports are chiefly to England, and are almost wholly agricultural, comprising bacon, pork, butter, eggs, grain, flour and meal, cattle, sheep, and pigs. The number of vessels registered as belonging to the port in 1888 was 60 (8500 tons). The entries and clearances each average 1800 (510,000 tons) per annum.

The municipal borough is divided into five wards, and is governed by ten aldermen, of whom one is mayor, and thirty councillors. The parliamentary borough has returned one member since 1885. The population of the municipal borough in 1881 was 22,457, of the parliamentary 29,181.

Waterford is chiefly celebrated as having been the landing place of Henry II. in 1171, when he received the submission of the Irish chieftains, and for its resistance to Perkin Warbeck, the Pretender, in the reign of Henry VII.

**WATER-GLASS**, a liquid mixture composed of sand (silica) and one of the alkalies, as potash or soda. The compounds are sodium silicate and potassium silicate. A similar compound is mentioned by Glauber in his treatise "De Lithiase" as early as 1614. The modern inventor, Dr. Von Fuchs, published an account of his process in 1825, and Mr. Frederick Ransome, of Ipswich, in ignorance of the German discovery, patented a mode of preparing water-glass in 1845, which he has since very considerably modified and improved. In 1857 M. Kuhlmann, of Lille, issued a pamphlet, in which he advocated the employment of water-glass to protect porous stone from the effects of the atmosphere, and also in stereochromy. Von Fuchs died at Munich on the 5th of March, 1856. His memoir and Kuhlmann's treatise were translated and printed in English in 1859 by direction of the Prince Consort. As a substitute for fresco water-glass has since been very successfully employed in the cartoons of the new Houses of Parliament, as, for instance, in Maclean's "Death of Nelson" and "Meeting of Wellington and Blücher on the Field of Waterloo."

The process of wall-painting in water-glass is as follows:

—The wall is first prepared with Portland cement and sand, and then covered with an *intonaco*, or thin coat of fine plaster, containing three parts of fine sand (composed of carbonate of lime) and one of cement, the whole being very evenly worked by the mason with a wooden hand-float. As soon as the wall is properly hardened the design may be traced, but the wall should be moistened immediately before painting. The colours are applied mixed with distilled water; not heavily or in any great body, says Brande, but thinly hatched over the surface. As soon as the picture is finished it is *fixed* by an application of the water-glass from a syringe made expressly for the purpose, called a *sprinkler*.

The water-glass is generally prepared by boiling silica with caustic alkali under pressure, about 60 lbs. to the square inch, in a digester, or by fusing sand with sodium or potassium carbonate in a reverberatory furnace. These silicates are much used in the manufacture of soap, forming cheap and efficient detergents when added to common soap. In a pure and solid state it resembles glass, and is slowly soluble in boiling water.

**WATER-HEMLOCK.** See CIGUTA VIROSA.

**WATER-HEN.** See MOOR-HEN.

**WATER-LILY** is the common name for the aquatic plants belonging to the order NYMPHÆACEÆ, especially applied to the species of the genera *Nymphaea* and *Nuphar*. The species of *Nymphaea* are numerous, and are found in lakes and rivers in almost every part of the world. They have a fleshy or tuberous rootstock, and floating nearly circular leaves, which are supported on cylindrical stalks, traversed by air-canals. The flowers consist of a calyx of four deciduous sepals, green on the outer surface and coloured on the inner; numerous petals, arranged in several rows, and passing gradually into the stamens, which are numerous, the outermost with petaloid filaments; the ovary is embedded within the receptacle, and contains many cells with numerous seeds. The fruit sinks to the bottom of the water when ripe, and liberates the seeds by rotting. The Common or White Water-lily (*Nymphaea alba*) is abundant in Britain in clear ditches, lakes, and slow rivers, and is also found in Europe, and Northern and Central Asia. It has beautiful large white floating flowers, which often close and sink below the surface at night. The rootstocks contain a large quantity of starch, and are used in France to make a kind of beer. The Blue Water-lily or Blue Lotus (*Nymphaea carulea*) is a native of Lower Egypt, in rice grounds and canals about Rosetta, Damietta, and Cairo. It has fragrant blue flowers, and was held sacred by the ancient Egyptians. *Nymphaea pubescens* is indigenous in India, Ceylon, Moluccas, Java, and has been also found on the western coast of Africa. This plant is called *Lotus* throughout India, and is held sacred by the Hindus. The Egyptian Lotus (*Nymphaea lotus*) is a native of Egypt, growing in slow-running streams, especially in the Nile near Rosetta and Damietta, and in rice-fields during the time they are under water. This plant is the sacred lotus of the Egyptians. [See LOTUS.] The Sweet-scented Water-lily (*Nymphaea odorata*) ranges in North America from Canada to the Carolinas; it is found in deep ditches and slow-running rivers. It has large white flowers of great beauty and fragrance, and is largely cultivated in this country. The Yellow Water-lily (*Nuphar lutea*) is abundant in Britain, and is frequently found associated with the white water-lily. It differs from that species chiefly in having somewhat heart-shaped submerged or floating leaves, five persistent sepals, the ovary situated on the top of the receptacle, and bearing a globose fruit which bursts irregularly to allow the seeds to escape. The flowers are yellow, and emit an odour of brandy, whence the name Brandy-bottle, often given to this species. The Smaller Yellow Water-lily (*Nuphar pumila*) is rare in Britain, occurring chiefly in small lakes

in the Highlands of Scotland. It resembles closely, except in size, the preceding species, of which it is perhaps only a variety. The Common Yellow Water-lily of America is *Nuphar advena*, found from Canada to Florida and Texas. The flowers have six sepals and the leaves are raised slightly above the surface of the water. See also *NELEMBIUM*, *VICTORIA*, and *EURYALE*.

**WATERLOO**, a village in Belgium, on the outskirts of the forest of Soignes, 8 miles S. by E. of Brussels. The population is 3000. Near this village was fought, 18th June, 1815, the battle between the allied English, Netherland, and German troops under Wellington, and the French under Napoleon, which resulted in the complete overthrow of the French emperor.

On 14th June the forces of Wellington, comprising about 92,000 British, Hanoverian, Brunswick, Nassau, and Netherland troops, were cantoned between the river Scheldt and Nivelles, his headquarters and reserves being at Brussels; while Blücher, with three corps of Prussians, about 90,000 men, occupied Namur, Charleroi, and the adjacent country on both sides of the Sambre. Napoleon decided to attack the Anglo-Prussian troops before the other contingents of the coalition could reach the frontier, and on the evening of the 11th advanced from Beaumont toward the point of junction between Blücher and Wellington, with 124,000 men. On the 15th he drove in the Prussian outposts south of the Sambre and entered Charleroi, which was evacuated by the Prussians, who by 2 a.m. of the 16th were concentrated to the number of 80,000 at Ligny, between St. Amand and Sombrefe, facing the Sambre. At 5 p.m. on the 15th Wellington issued orders to the outlying divisions of his forces to concentrate at Quatre-Bras, an important strategic point where four roads meet, from Brussels, Charleroi, Nivelles, and Namur. At 4 o'clock next morning the whole army was moving in the same direction, followed by Wellington, who, for the purpose of allaying public fear, had attended a ball given at Brussels by the Duchess of Richmond. Napoleon, having sent Ney with 40,000 men to occupy Quatre-Bras and prevent the junction of the English with the Prussians, moved with the rest of his army towards Fleurus, and at half-past 2 in the afternoon of the 16th attacked Blücher at Ligny. Ney, after fatal hesitation, engaged the Anglo-Netherland forces under command of the Prince of Orange at Quatre-Bras, 7 miles from Ligny, whither Wellington had ridden to confer with Blücher. After an engagement of five hours the Prussians were defeated at Ligny, and retreated toward Wavre; but at Quatre-Bras the allied forces held their ground until the British divisions of Picton and Cooke arrived, when the French retired, having failed to carry the position, but succeeded in hindering the junction of the English with the Prussians. Wellington's troops passed the night of the 16th on the field near Quatre-Bras, and at 10 a.m. of the 17th, the defeat of the Prussians and their line of retreat having been ascertained, moved towards Waterloo, where they arrived in the evening. By arrangement Blücher, if defeated, was to join Wellington at Waterloo with the least possible delay. On the morning of the 17th Napoleon, having directed Marshal Grouchy with 34,000 men and ninety-six guns to "follow up the enemy," proceeded with the main body of his army toward Waterloo, hoping to defeat Wellington's army before it could be reinforced by Blücher. He arrived too late in the day to give battle, and both armies bivouacked on the field.

The allied forces occupied a semicircular ridge which extended  $\frac{1}{2}$  mile in length in front of the village, and the French an opposite ridge, the two being separated by a valley from 500 to 800 yards in width. About 400 yards in front of the British right centre stood the stone château of Hougoumont, occupied by a strong force; and fronting the left centre, near the hamlet of Mont Saint-Jean, was

the farm of La Haye Sainte, also strongly occupied. Napoleon's army was drawn up in three lines on both sides of the road from Charleroi to Brussels. In his first line were the infantry corps of Reille and Drouet, with Piré's cavalry; the second line consisted of cavalry in the rear of the wings, and the third line of the sixth corps under Loban. Behind the whole was the Imperial Guard, constituting the reserve. Napoleon's headquarters were at the farm of La Belle Alliance on the Charleroi road, near his centre. The armies were nearly equal; the French numbered about 72,000 men, mostly veterans, of whom 15,000 were cavalry, and 210 guns; and the allies about 70,000 men, including 13,500 cavalry and 159 guns. The English contingent was a little over 25,000 men, mainly new recruits, the Netherlands about 17,500, and the rest were Brunswickers, Hanoverians, and other Germans. Rain from noon on the 17th until the next morning impeded movements, and Napoleon, confident that Grouchy would prevent the arrival of the Prussians, deferred the attack on the 18th until the ground should be dry enough for manœuvres of artillery. His intention was to turn the allied left, force it back upon the centre, and gain possession of the highway leading through the forest, Wellington's only line of retreat. To draw off the duke's attention to his right, the divisions of Jerome Bonaparte, Foy, and Bachelu moved at half-past 11 o'clock upon the château of Hougoumont. The surrounding wood was taken and retaken several times, remaining at last in the hands of the French; but the building defied every effort of capture, and at 2 p.m. was still in possession of its defenders. Shortly before this time the advance of the Prussian corps under Bülow, which had not participated in the battle of Ligny, was seen at a distance on the French right, approaching from Liège. Napoleon detached 10,000 men under Loban to watch the Prussians, and sent new orders to Grouchy to march upon St. Lambert and take the enemy in the rear. The weakening of his centre by the loss of Loban's troops necessitated a change in his plan of battle, and about half-past 1 o'clock Ney was ordered to break through the allied centre, and push their right back toward Brussels. Ney accordingly moved against La Haye Sainte, and after a fierce assault carried it; but his progress was checked by the English division of Picton and Ponsonby's brigade of heavy cavalry, and the French were forced back into the ravine, where Milhaud's Cuirassiers came to their assistance and compelled the English to retire. Picton and Ponsonby were killed. Ney re-formed his troops and again advanced to the attack, preceded by Milhaud's cavalry and a brigade of the light cavalry of the Guard. After a gallant defence the German troops who held La Haye Sainte were overpowered by the French infantry, and at half-past 3 the farm again fell into the hands of the assailants. The stubborn resistance of the English Guards at Hougoumont induced the French to direct a battery of howitzers against the building; but this, though set on fire by shells, was held to the last. Wellington, seeing the attack on this point was relaxing in vigour, strengthened his centre with troops from his right and rear. After the capture of La Haye Sainte there was a pause in the French operations against the allied centre, as Napoleon was watching the movements of Bülow's corps, which was beginning to debouch on the French right; and at 4 o'clock Wellington directed two bodies of troops upon the enemy at Hougoumont and La Haye Sainte. The attack upon the latter position was repelled by Ney, who sent for reinforcements to make a decisive onslaught upon the allied centre. Napoleon, unable to spare infantry and obliged to go to the right in person to look after the Prussians, gave him the Cuirassiers of Milhaud, not for the proposed attack, but to hold his position. An error of Lefebvre-Desnouettes, who commanded the light cavalry of the Guard, caused him to

follow Milhaud, and Ney, finding these two powerful bodies of horse under his command, hurled them in succession upon the squares of the enemy. Napoleon, learning what Ney was doing, exclaimed, "It is too soon by an hour;" but to sustain the movement thus begun, he ordered part of Kellermann's Cuirassiers to Ney's assistance. Behind these were standing 2000 heavy cavalry of the Guard, and some of their officers going forward to witness Ney's charges, the men understood them to give the signal to advance, and were soon mingled in the *mêlée*. Napoleon sent Bertrand to hold them back, but Ney had already launched them against the allied line, which had begun to waver, and, could Ney have had the infantry he desired, would have been utterly defeated. A French division under Durette had meanwhile carried La Haye and Papelotte on the allied left, and Lobau had driven Bülow's forces out of the village of Planchenois on the French right. But rumours of the approach of Blücher's army inspired renewed courage in the allies and damped the ardour of the French; and soon after 7 o'clock Napoleon, despairing of the co-operation of Grouchy, collected four battalions of the Middle Guard and six of the Old Guard for a final effort against the allied centre. The Middle Guard, led by Ney, advanced upon the enemy, but had scarcely commenced the attack when Ziethen's Prussian corps appeared on the French right. La Haye and Papelotte were speedily retaken, and the six battalions of the Old Guard separated from the Middle Guard, and formed in squares across the field to cover the retreat of Durette's fugitives. The Middle Guard, assailed in front and flank by the allies, held their ground under a fire which rapidly thinned their ranks. Ney, covered with dust and blood, with his clothes torn and his head bare, but still unwounded, though five horses had been shot under him, headed them on foot sword in hand. But the growing confusion in the French right demoralized the veterans, and they retreated. The other six battalions held their ground against overwhelming numbers. The dispersion of the French right by the cavalry brigades of Vandeleur and Vivian isolated them from the rest of the army, but still they stood firm. Finally, when five squares were broken and the rest began to show signs of exhaustion and depletion, the emperor gave the order for their withdrawal, and the cry, "The Guard is repulsed," converted retreat into flight. At this moment Wellington advanced his whole line of infantry, and the Prussians moving simultaneously, the rout of the French became complete. Napoleon, with one regiment of the Guard thrown into square, endeavoured to form a rallying point for the fugitives. Failing in this, he expressed his determination to die within the square, but was hurried away by Soult, the Guard covering his escape. The heroic band was soon surrounded and called upon to surrender. "The Guard dies, it does not surrender," is the reply popularly attributed to General Cambronne; and with the cry of *Vive l'empereur!* the remnant of the Guard charged upon the enemy and perished almost to a man. At half-past 9 p.m. Blücher and Wellington met at Maison du Roi in the rear of the late French centre, and Blücher continued the pursuit of the enemy. The total loss of the allies, including the Prussians, was about 23,000, and that of the French upwards of 30,000, besides 227 pieces of cannon.

Of the repeated orders sent to Grouchy at 10 the previous evening, at 3 a.m., and again immediately before the battle, none reached him till 4 p.m. Long before that hour Gerard and Vandamme besought him to break off his pursuit of the Prussians and march to Waterloo, but he refused. Instead of obeying the emperor's explicit orders when they finally reached him, he made a useless attack upon a corps which Blücher had left at Wavre.

Napoleon's errors were perhaps chiefly these—that he began the battle at too late an hour of the day, that

he wasted his cavalry reserves in a reckless manner, and that he neglected to take into account the steadiness with which British infantry are wont to maintain their ground. The Duke of Wellington is sometimes blamed for giving battle with a forest in the rear, which would preclude the possibility of retreat; but the groundlessness of the objection is apparent to those who are acquainted with the locality, for not only is the Forêt de Soignies traversed by good roads in every direction, but it consists of lofty trees growing at considerable intervals and unencumbered by underwood. It is a common point of controversy among historians, whether the victorious issue of the battle was mainly attributable to the British or the Prussian troops. The true answer probably is, that the contest would have been a drawn battle but for the timely arrival of the Prussians. It has already been shown how the allied line successfully baffled the utmost efforts of the French until 7 p.m., and how they gloriously repelled the final and most determined attack of the Imperial Guard about 8 o'clock. The British troops and most of their German contingents, therefore, unquestionably bore the burden and heat of the day; they virtually annihilated the flower of the French cavalry, and committed fearful havoc among the veteran guards, on whom Napoleon had placed his utmost reliance. At the same time it must be remembered that the first Prussian shots were fired about half-past 4, that by half-past 6 upwards of 15,000 of the French (Lobau's corps, consisting of 6600 infantry and 1000 artillery, with thirty guns; twelve battalions of the Young Imperial Guard, about 6000 men in all; eighteen squadrons of cavalry, consisting of nearly 2000 men) were drawn off for the new struggle at Planchenois, and that the loss of the Prussians was enormous for a conflict comparatively so brief, proving how nobly and devotedly they performed their part. The Duke of Wellington himself, in his despatch descriptive of the battle, says "that the British army never conducted itself better, that he attributed the successful issue of the battle to the cordial and timely assistance of the Prussians, that Bülow's operation on the enemy's flank was most decisive, and would of itself have forced the enemy to retire, even if he (the duke) had not been in a situation to make the attack which produced the final result." The French colonel Charras, in his "Campagne de 1815" (published at Brussels, 1858)—a work which was long prohibited in France—thus sums up his opinion regarding the battle:—"Wellington par sa ténacité inébranlable, Blücher par son activité audacieuse, tous les deux par l'habileté et l'accord de leurs manœuvres ont produit ce résultat." The battle is usually named by the Germans after the principal position of the French at Belle Alliance, but it is far more widely known as the battle of Waterloo, the name given to it by Wellington himself.

**WATER-MARK.** A device in wire is pressed upon paper, while still wet, in the process of manufacture, and it always retains the impression thus made as a semi-transparent outline. This was used by the very early paper-makers, and has ever since been customary. Most makers now add their name. Fine hand-made papers generally carry the date as well as the device and the name of the maker. A very favourite old device was a post-horn, another was a fool's cap and bells, another a water-pot, whence our names of *post*, *foolscap*, *pott*, &c., for certain sizes of paper with which those devices had been most frequently connected.

Water-marks are not only useful in enabling manufacturers to identify their work, but are invaluable in detecting forgery. The Bank of England notes depend chiefly upon secret points in the very elaborate water-mark they bear for their easy verification. A comparison of the water-mark, with the number of the note, instantly tells the bank official if it is a genuine note. So much is this

the case that one of the most celebrated forgeries on the Bank of England consisted in parting the note into two exceedingly thin sheets, each of course bearing the water-mark, and then imitating the printed surface upon the other half of the note. Precautions have been taken to prevent this being again feasible.

The celebrated IRELAND FORGERIES were not discovered for some time by the water-mark being carefully arranged, genuine old water-marked paper (bearing a "pot") being mixed with unmarked false sheets. But all forgers are not so clever. In the famous French parliamentary investigation about the Legion of Honour scandals in November, 1887, a great sensation was produced by the maker of the letter-paper of certain letters (of the president's son-in-law) proving its quite recent manufacture, whereas the letters were dated several years back; and this at once explained some very serious discrepancies between the truthful account of the witnesses of the original letters and the documents produced in court as being those letters. A number of such cases are upon record. Another great use of the water-mark is the detection of forgeries like Ireland's, done by less careful hands. The first thing which an antiquary does with a presumptively old book is to investigate the water-mark; and very experienced bibliographers can fix the date of an undated book within a few years by this simple test.

**WATER-METER**, an apparatus for measuring the water which flows through a conduit. Such meters, in various forms, are extensively used in our cities to measure the water used for manufacturing, and sometimes for domestic purposes. They may be divided into two classes, the *positive* and the *inferential* types of meters, the former actually measuring the whole of the water which passes through them, like a gas meter, the latter merely ascertaining the velocity of flow in a pipe of known capacity from which the quantity of water passing can be estimated.

As an example of the former class we illustrate, in the Plate, one of the most widely-known and appreciated instruments, Frost's piston water-meter, manufactured by the Manchester Water-Meter Company. Fig. 1 is an exterior view of the meter, fig. 2 a vertical, and fig. 3 a horizontal section. The upper portion of the apparatus contains the valve and the recording mechanism, while in the lower the water is measured by means of a piston, *p*, with leather packing, which works in an iron cylinder lined with brass. The valve, *v*, by which the water is admitted alternately to the upper and under side of the piston, is reversed at the completion of each stroke by the pressure of the water acting on the supplementary pistons, *xx* (fig. 3), to which it is admitted alternately by a small slide valve, actuated by the piston-rod of the large piston. By this arrangement the valve, *v*, is reversed with certainty and precision, and without the aid of either springs or weights. The construction of these meters is such that their liability to go wrong is reduced to a minimum, and attention or repairs are seldom needed.

As an example of the inferential type of meter we illustrate Siemens' water-meter, which is an adaptation of the turbine or reaction-wheel. The water passes through a funnel (fig. 5) into the turbine, from which it escapes by curved channels (shown in elevation in fig. 6), causing the drum or turbine to revolve more or less rapidly, according to the velocity with which the water leaves the orifices. The motion of the drum is communicated to the counter above, the reducing wheels being contained within a chamber partly filled with oil to insure continuous lubrication. The velocity of the drum is regulated by drag-stays or vanes attached to its outer edge, which produce a resistance increasing as the square of the velocity, and their area is so proportioned as to cause the drum to revolve at a speed commensurate with the quantity of water passing

through it. The drum or turbine is formed of brass mounted upon a spindle perfectly balanced to reduce friction to a minimum, and rides on a hard steel point working against a steel plate at the bottom of the spindle, both of which are kept covered with oil.

For the purpose of measuring large quantities of water with the smallest possible "head," the water is admitted to the drum from below (as shown in fig. 4), and the top of the central aperture by which it enters (fig. 7), is closed by a cap or back-valve. When a large quantity of water passes, the cap and drum are both raised from the seat and revolve upon the upper pivot, with extremely small friction. The cap rests upon a seating in which are two or more small helical grooves (shown in fig. 7), and when the pressure of the water is insufficient to lift the cap, it passes through these grooves and issues against the inner divisions of the drum in the direction of its intended motion, and thus causes it to revolve with an exceedingly small quantity of water. When the pressure is great enough to lift the cap from its seating, the effect of these grooves is inappreciable.

**WATER-MUSIC**, a very famous set of twenty-one instrumental pieces, composed by Handel in 1715, and played by an orchestra in a barge immediately behind the royal barge, in a procession by water, from Lincolnhouse to Whitehall. George I. was charmed with the music, and on finding that it was the work of his runaway music-director at once received him again into favour. (Handel had deserted him when Elector of Hanover.) Another royal excursion on the Thames in 1717 was similarly accompanied by Handel, and the king commanded the whole of the music to be thrice repeated. Up to the time of our fathers, this collection, as arranged for harpsichord or for pianoforte, retained its full favour. At present it is only historically interesting. It is written for two solo violins, flute, piccolo, two oboes, bassoon, two horns, two trumpets, and a stringed orchestra; and the sequence of the movements is very ingeniously varied in tune, tone, and style of composition, to prevent monotony or satiety.

**WATER-OUZEL** or **DIPPER** (*Cinclus aquaticus*) is an aquatic bird belonging to the Thrush family (Turdidae). The water-ouzel is a native of Britain, Europe, and Northern Asia, and is always found in the immediate vicinity of water, frequenting especially the clear pebbly streams and lakes of mountainous districts. It is about 8 inches in length, of a dark gray colour above, with the head and neck brown, brownish-red below, with the throat and upper part of the breast pure white. The bill is almost straight, compressed, and pointed at the tip, and the wings are large and pointed. The food of the water-ouzel consists of aquatic insects and their larvae, and small fresh-water molluscs, which it seeks in the water, diving with great facility, and remaining submerged for a short time. The nest is made of moss firmly matted together, and completely domed over so as to leave only a small aperture for the entrance and exit of the birds. Within this is an inner nest made of grasses and lined with leaves. The nest is placed on the bank of the stream or lake, in fissures of rocks or among the roots of trees, stones, &c. It contains five or six pure white eggs. Two or three broods are hatched in the season.

**WATER-POET, THE.** See TAYLOR, JOHN.

**WATER-RAT.** See VOLE.

**WATER-SCORPION.** See WATER-BUG.

**WATERSHED** (from the Ger. *wasserscheide*, water-parting), is a term in physical geography applied to the high ground or barrier which separates the various rain-basins of a country. From hence the waters are *shed* or parted, on either hand, to fall into some great river channel, lake, or ocean. Usually the watershed is on elevated ground, but this is not invariably the case. As the mistake of confusing the watershed with the slopes on which



the water of a given stream is shed (properly the basin) has become distressingly frequent, physiographers now generally use the term *water-parting*, which is not ambiguous.

**WATERSPOUT**, a meteorological phenomenon of peculiar character, which is occasionally observed on land, but usually occurs out at sea. It consists of a cone-shaped pillar of condensed vapour, which descends, with the apex downwards, from a dense cloud, and at sea meets a somewhat similar cone, in a reversed position, from the surface of the water. The two may not inaptly be compared to a gigantic hour-glass. Occasionally they unite, but more frequently they are carried along the sea until they disperse. If wind prevails the upper column assumes an oblique direction; in calm weather it preserves its vertical position. It is customary for ships to effect its dispersion by firing a gun. The cause of this phenomenon is the collision of opposing currents, which set up a whirlwind, that is, a gyrotory movement of the air of such swiftness as to spin the clouds into a column and to whirl up the spray of the broken waves, which foam or rather boil at the base of the column. It used to be thought that the water was drawn up by a vacuum produced in the centre of the rotating cloud column, but this is conclusively proved to be incorrect. Like all storms the waterspout proceeds while it rotates, moving (and rotating) in the direction of the stronger of the two currents which produce it.

**WATERSTONES**, the local name for a series of white and red sandstones occurring at the base of the upper division of the TRIASSIC SYSTEM in Cheshire. They are so called from the copious supply of water they yield when tapped, and are extensively quarried for building purposes.

**WATERTON, CHARLES**, an eminent naturalist, was born about 1782 at his seat of Walton Hall, near Wakefield, and received his education at the Roman Catholic College of Stonyhurst in Lancashire. At nineteen or twenty he proceeded to Demerara to look after some family property, and found himself in and near a region abounding with objects that rewarded the attention of the naturalist. After a series of years of varied experience in America and Europe Waterton published, in 1825, his "Wanderings in South America, the north-west of the United States, and the Antilles, in 1812, 1816, 1820, and 1821." The strangeness of some of the adventures recorded in it, the racy style, the writer's enthusiasm, and its impress of strong individuality, made the work successful. It was followed by "Essays on Natural History," in three series, published in 1838, 1841, and 1857. Waterton died on the 26th of May, 1865.

**WATFORD**, a town of England, in the county of Herts, 18 miles from London by the North-western Railway. It is situated close to a ford over the Colne (whence its name). The town has been much improved. A public library and school of science and art were opened in 1874. The church, in the centre of the town, is a large edifice with a massive unbattled tower, 80 feet high, surmounted by a small spire rising about 20 feet higher. St. Andrew's, a district church, was erected in 1858. There are also places of worship for dissenters, free schools, almshouses, and other charities. There are some handsome almshouses of the Salters' Company, and also of the Countess of Essex, founded in 1876, and the London Orphan Asylum, removed from Clapton in 1871, and other benevolent institutions. The town has manufactures of malt and straw-plait, a silk mill, employing 200 hands, and two very large paper mills. It is also a large market for corn and live stock. The Grand Junction Canal runs on its western side. The population in 1881 was 10,073.

**WATLING STREET**, one of the four great Roman roads in Britain. It followed a somewhat circuitous course from Kent to Chester and York, and northwards in two branches to Carlisle and the neighbourhood of Newcastle.

Its very name is largely preserved, for instance in Dover and in London (where Watling Street is a busy street, nearly parallel with Cheapside and with Cannon Street); and it forms the boundary between Warwickshire and Leicestershire, and is the present road between Ilkley and York. It was the line of division in Alfred the Great's treaty with Guthorm the Dane, when it was agreed that the latter was to possess all the country "north of Wathlinga-strete." So celebrated was this fine street that its mention is frequent in our early writers. We know from a passage in Chaucer's "House of Fame" (ii. 427) that this familiar name was even applied to the Milky Way—

"Lo there! quod he, east up thine eye,  
So yonder, lo! the Galaxie  
The which men clepe the Milky Way.  
For it is white, and some parlay  
Y-callen it han Wathlinga-strete."

It is usually held that *Watling* is an ancient British corruption of *Vitellianum*, the road being ordered by, and named after, the Emperor Vitellian.

**WATT**, a measure of electrical power suggested by Dr. Siemens when president of the British Association in 1882 (and named in honour of James Watt), its value being one 745th of a horse-power. It is that power given by one ampere working through one volt. It is of great value to electrical engineers as eliminating the factor 745, which is perpetually necessary otherwise, either as multiplier or divisor, in such calculations as those for determining the current which an electro-magnet of certain dimensions would carry, which is done by computing how much horse-power will be expended in it, and comparing the result with the cooling surface available. In this the entire horse-power is an inconveniently large unit, and the Watt proves of service.

The way in which the factor 745 occurs is this. A horse-power is 550 foot-pounds per second = 76 kilogramme-metres =  $76 \times 10^5$  gramme-centimetres =  $745 \times 10^7$  ergs per second. Therefore to find the rate at which actual work is consumed—for example in an electric lamp, &c.—measure the current in amperes and the difference of potential between the terminals in volts; multiply these together and divide by 745, and the quotient gives the horse-power.

**WATT, JAMES**, was born at Greenock on 19th January, 1736. His father, who was for upwards of twenty years town councillor, treasurer, and bailie of Greenock, made a fortune by trade, part of which, however, he lost before his death, in 1782.

Being of a delicate constitution, the early education of James Watt was in a great measure of a domestic character. About 1750 he amused himself by making an electrical machine, and chemistry was a favourite subject when he was confined by ill-health to his father's dwelling. He studied natural philosophy in the popular treatise of S'Gravesande, translated from his "Physices Elementa Mathematica," and he also read works on surgery and medicine. In his sixteenth year he was apprenticed to an instrument maker in Glasgow. At the end of three years he removed to London, in 1755, and placed himself with a mathematical instrument maker; but in little more than twelve months the state of his health compelled him to return to Scotland.

Watt now endeavoured to settle himself in business in Glasgow, but owing to his not being a burgess he met with opposition from the corporations of arts and trades. The university, however, offered him an asylum within their precincts, where they permitted him to establish a shop; and they also honoured him with the title of their mathematical instrument maker. These circumstances happened about 1757, and he retained his apartments in the university till 1768, when an event occurred to which the commencement of his invaluable discoveries may be most



distinctly assigned. Professor John Anderson, who then occupied the chair of natural philosophy in the university, having requested him to examine and repair a small model of Newcomen's steam-engine, which could never be made to work satisfactorily, his sagacity led him to discover and remove the defects of this model; and he also discovered the imperfections of the machine itself, and was led to investigate those properties of steam upon which its action depended. The character of his improvements will be found in the article *STEAM-ENGINE*.

In 1764 he married his cousin, Miss Miller, and his wife being the daughter of a freeman he was now enabled to open a shop in the Saltmarket, Glasgow, where he continued to make improvements in the steam-engine, and where, in addition to his employment as a mathematical instrument maker, he devoted much time to the practice of land-surveying. He afterwards adopted the profession of a civil engineer. In 1768 he found in Dr. John Roebuck an individual capable of appreciating the value of his invention, and sufficiently enterprising to support him in further experiments. The assistance of this gentleman enabled him to construct an engine, for which he obtained a patent on 5th January, 1769.

In the summer of that year, however, the mining speculations of Roebuck involved him in such embarrassments that he was compelled to abandon the experiments with the new motive machine, and Watt himself was obliged to return to his former avocations of engineer and surveyor. While engaged in the latter part of 1773 in surveying a line of canal between Fort William and Inverness, since executed by Telford under the name of the Caledonian Canal, he received intelligence of the death of his wife; and he soon afterwards accepted an invitation from Matthew Boulton, the founder of the celebrated establishment at Soho, near Birmingham, to settle in England.

Poulton, to whom Dr. Roebuck transferred his share in the property of Watt's invention, was a man eminently qualified to bring it into operation. Their connection commenced early in 1774, and they remained in partnership until 1800, when Watt retired from business; but their friendship continued undiminished until Boulton's death.

At the latter end of 1774 Watt completed at Soho his fourth model engine, which was exhibited to a deputation from the Cornish miners and other persons competent to judge of its performances, and were deemed highly satisfactory. Perfect, however, as was the action of the improved machine, the patentees knew that much remained to be done to bring it into extensive operation. They therefore applied to Parliament for an extension of the term of their patent; and although the application was met by a violent opposition, occasioning great expense and anxiety to the patentees, it was ultimately successful. Being thus secured a return for their outlay, the patentees prepared for the manufacture of steam-engines upon the most extensive scale, and with a degree of accuracy never before attained in the production of large machinery.

Of the spirited manner in which Boulton conducted the mercantile department of the great adventure some idea may be formed from the fact that upwards of £47,000 was spent before the patentees received any return; but at length their remuneration began to pour in, and in no scanty stream. They were put, however, to great expense by legal proceedings against infringements of their patent, and in defence of the patent itself. At length, after a series of trials extending from 1792 to 1799 a unanimous and clear decision was given, fully vindicating and establishing the rights of the patentees.

In 1794 the sons of Messrs. Boulton & Watt were admitted to the partnership, and on the expiration of the extended term of his patent, in 1800, the latter resigned his share of the business to his two sons, and retired into private life.

As there were several scientific men residing about Birmingham who were on terms of intimacy with Watt and his partner, an association was formed under the title of the Lunar Society, the members of which met monthly on the night of the full moon for the purpose of social converse. At one of these meetings, according to Arago, a suggestion was thrown out which led Watt to the invention of the useful little machine known as the copying press, for which he obtained a patent. Towards the latter end of 1786, on a visit to Paris, undertaken at the instance of the French government for the purpose of suggesting improvements in the *Machine de Marly*, Watt became acquainted with Berthollet, whose method of bleaching with chlorine he brought to this country, and introduced, with certain improvements of his own, in the bleachworks of Mr. Macgregor, near Glasgow, whose daughter he had married in 1775.

Concerning Watt's share in the discovery of the composition of water, an investigation in which he, Cavendish, and Lavoisier were engaged about the same time, we must refer those who are curious to Arago's *Life of, or Eloge upon Watt*, and to the "Historical Account of the Discovery of the Composition of Water," by Lord Brougham.

One of the last of the projects to which this able man devoted his attention after his retirement from business was a machine for copying sculpture, with which he proceeded so far as to execute several specimens. He kept its construction strictly secret; but when he had proceeded sufficiently with his design to contemplate obtaining a patent, he found that another person in his neighbourhood was engaged upon a similar plan. A proposal was subsequently made for obtaining a joint patent but Watt was unwilling, at so advanced a period of life, to embark in such an undertaking.

About 1790 he had purchased an estate called Heathfield, near Soho, where he resided to the end of his life; and he held also a property on the banks of the Wye, in Wales. It is related that, when upwards of seventy, he imagined his intellectual faculties to be on the decline, and accordingly determined to put them to the test by undertaking some new study. Having selected the Anglo-Saxon language for this experiment, he mastered it with a facility which proved that there was little ground for his fears. He died 25th August, 1819, in his eighty-third year.

In acknowledgment of his invaluable services it was intimated to Watt a few years before his death that "the highest honour usually conferred in England on men of literature and science was open to him, if he expressed a wish to that effect;" but while he felt flattered by the intimation, he determined to decline it. He became a member of the Royal Society of Edinburgh in 1781, of that of London in the following year, of the Batavian Society in 1787, and in 1808 a correspondent of the French Institute; and in 1814 the "Académie des Sciences" of the Institute elected him one of its eight foreign associates. In 1806, by a spontaneous vote, the University of Glasgow conferred upon him the honorary degree of LL.D. In 1824 a subscription was entered into for a statue, which was sculptured by Chantrey, and is now in Westminster Abbey. Another statue by Chantrey adorns an elegant chapel erected by Watt's only surviving son, at the parish church of Handsworth, near Birmingham, in the chancel of which he was interred; and a very handsome one, by Munro, was erected by public subscription in Birmingham itself, in 1868. Statues have also been erected in George Square, Glasgow, and in Glasgow University.

**WATTEAU, ANTOINE** (1684-1721), a painter of very high gifts, though applied in a highly artificial way, created a school of mock-pastoral painting, of which he was not only the inventor, but the chief, and indeed only truly great exponent. He was quite a self-made man, although to look at his canvases one would think he never

knew of work or poverty. His *fêtes galantes* are full of courtly gallants and dames, models of elegance, and, if the truth must out, of fascinating worthlessness, whose whole life is spent, so far as Watteau shows us, in ornamental idling, in dressing, dancing, singing, and flirting, and playing at shepherds and shepherdesses in the miniature lawns and thickets of Versailles, where the sheepfolds are tied together with satin ribbons, and a shower of rain would be the signal for the desertion of the sheep. Watteau was the son of a peasant, a thatcher of Valenciennes, and becoming known locally as a painter, went to Paris in 1702, when he was but eighteen, became acquainted with the scene-painter Gillot, and made the green-room of the opera his field of study, and the pastorals of the stage his chosen subject. In the hands of his plagiarists, Lancret, Boucher, &c., the style is not only absurdly artificial and bad, but even immoral; but in Watteau himself nothing of the least indecorousness is found, and the frivolity of the subject is carried off with such airy lightness, invention, and wit, such ease, such fine colour and graceful attitudes, that these small boudoir paintings vie in artistic force, and in the feeling of space they convey, with canvases of many times their size.

**WATTLE-BIRD** (*Anthochaera*) is a genus of birds belonging to the family Meliphagidæ (*HONEY-EATERS*). The Long-eared Wattle-bird (*Anthochaera inauria*) is a native of Tasmania, distinguished by having a pair of long yellow and orange wattles hanging down from the ears. In the male these curious appendages are about 1½ inch in length; in the female they are half an inch shorter. The plumage is varied with blackish-brown, white, and gray, the upper surface being darkest. The tail is very long—fully 8 inches in the male—of a narrow wedge-shape, slightly notched at the tip. The male measures nearly 18 inches in length. These birds inhabit the forests of Tasmania, where they exist in great numbers; they are highly prized for the table. The food consists of the pollen and honey of the Eucalypti and Banksias, and also of insects. This species is active and sociable in its habits, forty or fifty being sometimes seen on a single tree. Its flight is short, and much resembles that of the common magpie. Its note is a harsh and disagreeable scream. The nest is cup-shaped, and composed of fine twigs, grass, and wool. The Short eared Wattle bird (*Anthochaera carunculata*) is a nearly allied species, a native of the southern parts of Australia. Its general colour is grayish-brown, varied with pale gray; the tail is wedge-shaped, but broader than in the preceding species; underneath the eye is a large white patch, and from the posterior part of the lower margin of this depends a small bright red wattle about half an inch long. The length of the bird is about 14 inches. In its habits, food, and note it resembles the preceding species.

**WATTS, ISAAC**, an English divine and hymn writer, was born at Southampton, 17th July, 1674, and educated for the nonconformist ministry.

Watts preached his first sermon on the day on which he completed his twenty-fourth year, 17th July, 1698. In the same year he was chosen assistant to Dr. Chauncy, pastor of an Independent church in London. Soon after his entrance upon this charge he was seized with a dangerous illness, which left him with a constitution greatly impaired. His health returned gradually, and he performed his duty, with the help of an assistant, till 1712, when he suffered from a severe attack of fever, and never entirely recovered from its effects.

This illness excited the lively sympathy of all his friends. Foremost in all kind offices was Sir Thomas Abney, who invited him to try the effect of change of air at his house at Theobalds. Watts accepted his invitation, and went there intending to stay only a single week, but remained until his death, 25th November, 1748. In 1728 he received from Edinburgh an unsolicited diploma of D.D.

**WAVE.** The transmission of a wave through a mass of fluid consists in the travelling onward of a certain shape of its surface and arrangement of its particles. The particles themselves do not travel steadily onward, they oscillate or revolve about centres which are not far from their respective positions of repose. In fact wave-forms are the locus of a series of vibrating points.

Vibrations are periodic oscillations or swings of any body or particle of a body. Thus it would be correct to speak of the vibrations of a pendulum or of a drop of water, or of a molecule of air or of iron when we are respectively regarding a clock, a sea-wave, a sound, or an effect of heat or light; and there is practically no doubt but that we might justly add electrical phenomena to the list.

**Water-waves.**—A number of successive vibrations of the adjoining particles of a body will yield a wave. In a water-wave, for example, each drop oscillates (neglecting small differences) vertically in a circle or oval, and at the moment that one drop has risen to the top of its swing (or, as we call it, the *crest* of the wave), the next drop behind it is a little short of the same point, and the next drop behind that still a little shorter, and so on until we reach a point where a drop is at the bottom of its swing, preparing to rise; and this point is the *trough* of the wave. The next drop behind that is one which is descending, but has not quite reached the trough; the drop behind that is two stages from the trough in its descent, and so we proceed till we reach a drop which, like the first one we considered, is at the crest of a wave, but unlike that is regarded not as having risen but as being about to descend. The difference is merely in the manner of regarding the drop which is supposed to be, at the moment, stationary. Now the state of the wave just described, as if it were photographed by an instantaneous process, lasts only for the one moment, since all the particles are in active motion. At the next moment the drop next behind the first one we considered will be at the crest of the wave, and the whole set of drops will be one phase forward in their vibration, our original particle having now begun its descent towards the trough, and so on with the rest; at the next following moment the third drop will be at the crest, the second will be one stage downwards, and the first two stages downwards in descent, and so on. Thus it is evident that the *wave* progresses, but the *vibrations* do not. For more detailed consideration of sea-waves, see the next article.

**Light-waves.**—The vibrations of the imaginary ether substance which produce light are, like water vibrations, transverse to the path of the wave, but they are not merely vertical—they are in all directions. Thus the path of a light-wave (taking a single beam of light, for clearness) is not along one surface like the path of a water-wave, but along all surfaces alike which surround the imaginary line of direction, so to speak—the core of the beam. Of the shape of heat-waves, and still less of electrical waves, we have as yet no conception.

**Sound-waves.**—The vibrations of air, or of other bodies which produce sound, are longitudinal to the path of the wave, on the other hand, for sound-waves consist of compressions and rarefactions. A tuning-fork when set vibrating gives a series of impulses to the air—drives the particles together, in fact, into a *crest* of condensation; the elasticity of the air drives that condensation forward until it strikes the ear as a little impulse, though the original particle moved but a very little way. Meanwhile the tuning-fork has swung back and has produced a rarefaction, not only releasing the compressed particles which it lately drove before it, but giving them more room than they had when it was at rest before beginning to vibrate. These particles, therefore, by their natural elasticity, spring apart in a pulse or *trough* of rarefaction, and the group behind them follow also, and so on till the pulse of rarefaction reaches the listening ear. Every phase between compression

and refraction, between the outward swing and homeward swing of the particles of air, is thus transmitted as it is produced by the vibrating fork, and passes from particle to particle till it arrives at the particles in contact with the drum of the ear, and these set the drum vibrating, and so cause the sound-wave to arrive at the nerves of the ear and to be perceived as sound.

**WAVERLEY NOVELS.** See SCOTT, SIR WALTER.

**WAVES OF THE SEA.** The most obvious appearance presented to the eye by the waves of the sea is the onward travelling of a series of parallel ridges and furrows which are of equal or nearly equal size, and of a serpentine shape in profile. The tops of the ridges are the *crests*; the furrows between them, *troughs*; and when the trough of a wave is spoken of as having a definite level and position, the lowest part of the hollow is meant. See the diagram of a wave in the article ACOUSTICS.

The *height* of a wave is measured from trough to crest. The greatest height which has yet been accurately measured in the open sea, is about 43 feet. The level of still water is not exactly midway between the crests and the troughs; for the crests, being of a more peaked form, rise somewhat more above that level than the troughs sink below it.

By the *length* of the waves of a series is meant the distance, measured in the direction of advance, from crest to crest, or from trough to trough. The greatest length which has yet been measured in the open sea is about 560 feet.

By the *period* of a wave is meant the time that it takes to advance through a distance equal to its length; which is also the time occupied by a particle of water in making one revolution in the orbit to be presently mentioned.

The rate of progression of waves is very various, depending generally upon the force of the wind. But there are

Fig. 1.



Fig. 2.

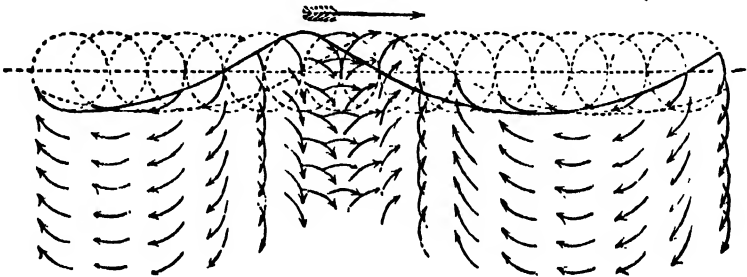


Fig. 3.



also other causes, as for instance the initial velocity when the wave is due to some great disturbance. At the mighty eruption of Krakatoa, which remade the Straits of Sunda in 1882, the gigantic wave was formed at twelve minutes before noon. It struck Point de Galle in Ceylon (1900 miles) at 1.30 p.m.—i.e., having travelled about 20 miles a minute. It struck Mauritius (3140 miles) at 2.15 p.m., which gives a rate even a little higher than the last.

Fig. 4.



It is sufficiently evident from the appearance of the surface of the water, that its particles, during wave-motion, move up and down through a vertical distance equal to the height of a wave. An inspection of the movements of floating bodies shows further, that the particles also move backward and forward through a horizontal distance, which is in some cases equal to, and in other cases greater than, the extent of their vertical motion; and that those movements are combined in such a manner, that each particle of water revolves in a vertical plane, in an orbit which in deep water is a circle, and in shallow water a flattened oval. The centre of the orbit is somewhat above the position of the particle in still water. A particle in the trough of a wave is moving backwards; on the front slope, upwards; on the crest, forwards; on the back slope, downwards.

Figs. 1, 2, and 3 are examples of the orbits of particles of water in waves. Fig. 4 shows the mode of motion of the particles of waves near the surface of deep water. The straight arrow represents the direction in which the wave is advancing; the dotted circles are the orbits of the surface particles; the plain curved line is the profile of a wave at a given instant; the curved arrows represent the motions of the particles during one-sixth of a revolution; and the dotted curve represents the profile of the wave in its new position, at the end of that sixth of a revolution of the particles, being one-sixth of a wave-length in advance of the former position.

The velocity of revolution and dimensions of the orbits of the successive layers of particles below the surface diminish in going downwards; and the extent of vertical motion diminishes more rapidly in going downwards than the extent of horizontal motion.

Fig. 5 illustrates this; showing how at greater and greater depths the orbits of particles are more and more flattened; and how at the bottom their motion is simply an oscillation backwards and forwards in a straight line.

If the whole mass of water, when still, be conceived to be divided into horizontal layers and also into vertical columns, the serpentine rolling of each layer, when agitated by waves, may be compared to that of a sheet laid upon the ground and shaken up and down at one edge. The motion of the columns may be compared to the bending and swaying of the stalks in a wind-swept field of corn—with this addition, that each column of fluid becomes alternately taller and slenderer, and shorter and thicker; being taller and slenderer while it is bending forwards, shorter and thicker while it is swaying back.

No wave can be continuously transmitted in which the height exceeds a certain proportion to the length. As that proportion is approached, the crests of the waves become gradually steeper and sharper, until at length they break up into foam and spray, or are made by the wind to curl over and fall forward.

Two or more series of waves may traverse the same mass of water in the same or different directions at the same time; the motion of each particle being the resultant of the several motions which it would have received from the several series of waves separately. It is upon this principle that, as so often observed, the ninth wave (or seventh,

Fig. 5.



eight, tenth, &c.) breaking on a shore is much larger than its fellows.

"Wave after wave, each mightier than the last,  
Till last a ninth one, gathering half the deep,  
And full of voices, slowly rose and plunged."  
—Tennyson, "Holy Grail."

This is due to two separate wave-systems, arising from two distinct causes coinciding at precisely those points that superimpose one wave-system upon the other.

Waves undergo reflection at the face of a steep cliff or wall, and refraction (or change of direction) when passing from one depth of water to another.

*Surf-waves and Breakers.*—When waves travel from deep into shallow water, their periodic time continues unaltered; and therefore they become gradually shorter. The energy of each wave is gradually communicated to a smaller and smaller mass of water, and the extent of motion of the particles consequently increases. Thus it is that waves are produced, on some rocky coasts, of 150 feet high. But to that increase a limit is put by the breaking of the wave crests. Thus the waves travelling over long shallows are gradually broken down, and their energy expended in producing foam and eddies.

*Waves of translation* are produced by the transmission of a motion of such a kind, that each particle, instead of returning periodically to the point from which it set out, is brought, at the end of the wave-period, to a point in advance of or behind its original position, as the case may be. A wave of translation is said to be positive or negative, according as it shifts the water forwards or backwards.

A positive wave of translation is *solitary*; that is, it travels alone, and is not necessarily preceded or followed by a series of other waves. Its surface presents a swell rising above the level of still water throughout its whole length; and each particle at which it arrives is lifted up from a state of rest, carried forward in an arched curve, and set down at rest in a position at a certain distance in advance of its original position, which distance is sensibly the same throughout the whole depth of the water. The length of a positive solitary wave of translation is shorter, by the distance through which a particle is transferred, than the circumference of a circle whose radius is the undisturbed depth of the water. The velocity with which the wave travels is sensibly equal to that acquired by a heavy body in falling through half the depth from the crest of the wave to the bottom of the water. If a wave of translation is a *negative* wave, or wave of backward translation, it presents a hollow, sinking below the level of still water throughout its whole length. The height of the *equivalent undulum* of a wave of translation, is equal to the depth from the crest or trough of the wave, as the case may be, to the bottom of the water.

The motion of the tides is analogous to that of a series of very long waves, in which the extent of the horizontal motion of the water is very much greater than that of the vertical motion. See TIDES.

*Action of Waves on the Coast.*—The height of the waves which beat on a given coast during a storm depends on what is called the "fetch;" that is, the distance from the weather shore where their formation commences. The following formula is nearly correct during heavy gales, when the fetch is not less than 6 nautical miles; height in feet =  $1.5 \times \sqrt{\text{fetch in nautical miles}}$ . The following are some examples of the pressures of waves against a vertical surface, as observed at Skerryvore:—

	Summer average.	Winter average.	Storms.
In lbs. per square foot, . .	611 ...	2086 ...	6083
In feet of water, . . . .	9.8 ...	33 ...	97

Greatest height of breakers, as observed on the south-west coast of Ireland, 150 feet.

Recent investigations tend towards the conclusion, which is in accordance with observation, that every wave is more or less a "wave of translation," setting down each particle of water, or of matter suspended in water, a little in advance of where it picked that particle up, and thus by degrees producing that heaping up of water which gathers on a lee shore during a storm. This property of waves accounts for the facts, that although they tend to undermine and demolish steep cliffs, they heap up sand, gravel, shingle, or such materials as they are able to sweep along, upon every flat or sloping beach against which they directly roll; that they carry such materials into bays and estuaries; and that when they advance obliquely along the coast they make the materials of the beach travel along the coast in the same direction. The flowing tide augments, and the ebbing tide diminishes, the speed and force of storm waves; and hence the observed fact, that the most powerful action of such waves on the coast occurs after half-flood, when the shoreward current is strong.

*Effects of Oil in Stilling Water-waves.*—As long ago as the first century of our era, the Latin naturalist, Pliny, wrote on the power of oil to prevent waves from breaking, and noted that divers used it to improve the subaqueous light, which is much lessened by a chopping sea—a practice still in use among the coral divers of the Mediterranean. Shetlanders and Highlanders to this day, when salmon fishing, often pour a little oil on the waves so as to be able in the calmer water thus made, to spear their fish with surer aim. At Bermuda and at Gibraltar, men of other tongues have learnt a like lesson. The first deliberately to investigate this power of oil was Dr. Benjamin Franklin. He found it regarded in his day, as it too often is in our own, as an absurd fable, and in his practical way he tested it while in this country on the Round Pond, at Kensington Gardens, in London. He failed to leeward, the oil beating back with the waves, but by crossing to windward he was able, with one teaspoonful of oil, to calm a surface of at least half an acre. He found that one drop of oil will influence a circle of considerably over a foot in diameter. Afterwards sailing out in a storm half a mile from Portsmouth, he poured a gallon or two of oil into the sea, with instantaneous effect. Though white-crested waves broke all round, not one was to be seen in the smoothly rolling track behind his boat. These experiments were tried about the year 1770.

Nothing further was tried under scientific conditions for a long period; although seamen used their traditional knowledge from time to time. Whalers in especial were well acquainted with the calming effects of the leakage of blubber oil on the arctic seas, or amid the gales off Newfoundland; palm-oil coasters on the stormy shores of Guinea often owed their safety to the sacrifice of a puncheon of their cargo. About 1878 the subject was again seriously revived, and many experiments were made, culminating in those of Mr. Shields in 1882 at Peterhead, in Aberdeenshire, the easternmost headland and one of the most exposed points of the Scottish coast. He submerged 1200 feet of piping, so arranged as to be able to eject oil on the sea bottom in a line across the mouth of the harbour. On the 1st of March, when huge billows were breaking 20 feet high, and no boat could live in such a sea, Mr. Shields' apparatus was used to eject 100 gallons of fish oil: as soon as this rose to the surface the waves ceased breaking at once, and if any boat had ventured out in such a storm she might have ridden into the harbour in safety on the great smoothly rolling waves with perfect ease. In the following October pipes were laid down at Aberdeen. The importance of this discovery needs not to be impressed.

**WAX** (Ang.-Sax. *was*; German, *wachs*). There are several varieties of this substance. *Bees'-wax*, with which the honeycomb is constructed, is a secretion from the ven-

tral scales of the bee. From the comb the wax is extracted chiefly by pressure and by melting it in hot water, and the impurities having subsided, it is poured into moulds. It has a yellowish or orange colour and peculiar odour. Even in winter it is soft enough to be indented by the nail, and in summer it is much softer. It melts at about 143° to 150° Fahr., and is a non-conductor of electricity.

**White Wax** is obtained by melting yellow wax by means of steam, and running it off into a perforated trough called a cradle, from which it falls into water. By this means it is solidified and converted into a kind of ribbon; it is afterwards bleached, re-melted, re-bleached, and refined. Pure wax thus obtained is nearly devoid of smell, and white with a yellowish tint; it is brittle and insipid; its melting point is 158° Fahr., and it solidifies at 149°. Its specific gravity is .96.

Bees'-wax contains three substances, which are separated by the action of alcohol: myricin, insoluble in boiling alcohol; cerotic acid, soluble in boiling alcohol, but crystallizing out on cooling; and cerotin, which is soluble in cold alcohol. The two former bodies have been already noticed. [See MYRICIN; CEROTIC ACID.] Cerotin is a soft fat existing in the wax to the extent of 4 or 5 per cent., very soluble in alcohol and ether, and melting at 28.5° C. (83° Fahr.)

The term *wax*, originally applied only to the product of the bee, is now employed to designate several other fatty bodies—animal, vegetable, and mineral. It is much used in commerce as a synonym for solid PARAFFIN from mineral shale and petroleum, and occasionally for spermaceti. There are a number of waxes of vegetable origin, of which the best known are Chinese wax and Japan wax. Chinese wax or vegetable spermaceti is obtained from some trees punctured by an insect; it is found as a thin white coating on the branches, and is melted off by boiling these in water. It consists of cerotate of cerotyle,  $C_{27}H_{53}(C_{27}H_{55})O_2$ . Japan or tree wax is obtained from the root of *Rhus succedanea* (natural order Anacardiaceæ). It is soluble in boiling alcohol, and melts at about 50° C. (122° Fahr.) It is a glyceride, and yields on decomposition palmitic acid and glycerine.

**WAX, SEALING.** See SEALING WAX.

**WAX-PALM.** See CERONYLON ANDICOLA.

**WAX-TREE.** See VISNIA.

**WAX-WING** (*Ampelis* or *Bombycilla*) is a genus of birds belonging to the family Ampelidæ (CHATTERERS). The old family Ampelidæ is now divided into two families, the true Chatterers (*Ampelidæ*) and the American Chatterers (*Cotingidæ*), the latter being confined to America, and belonging to the songless section (*Mesonyodi*) of the Passeres. The restricted family Ampelidæ contains only a few species, of which the waxwings or waxen chatterers are the most important.

The Bohemian Waxwing or Bohemian Chatterer (*Ampelis garrulus*) is distributed throughout the northern parts of both hemispheres, migrating southwards in the autumn. It is an occasional winter visitor to Britain, especially in severe seasons. It has a short strong bill, broad at the base, slightly notched at the tip, with a wide gape; the wings are rather long, broad and pointed; the tail is short and even; the legs are short, and the toes are long, with sharp claws. The waxwing measures about 8 inches in length. The plumage is very soft and silky, light grayish-brown above, becoming paler on the under surface. The head is adorned with an erectile crest of elongated silky feathers of a grayish-brown colour, tinged with purplish red. The primaries are black, with a bright spot of yellow near the tips of their outer webs, which are white. The secondaries are dusky gray, tipped with white, and eight or nine of them have flat red horny appendages, similar in appearance to sealing-wax, attached to the extremity of the shaft. The tail is gray, with a broad band

of yellow at the tip, before which is a blackish band; the tips of the tail-feathers are also furnished with wax-like appendages. The throat is black, and there is a broad band of the same colour round the eyes and on the back of the head. The female is very similar to the male, but the yellow on the wings and tail is not so bright, nor are the wax-like appendages so large or so numerous.

The waxwing feeds on various kinds of berries and fruit, on the buds and sprouts of the beech, maple, and fruit trees, and also on insects. It is an active lively bird, and is seen in considerable flocks in winter. It breeds in high latitudes, building its nest in fir trees. The nest is large, composed of lichens, with twigs of firs on the outside, and lined with a little grass and a few feathers; the eggs are usually two, of a fine blue colour, spotted with black.



Bohemian Waxwing (*Ampelis garrulus*).

The waxwing is easily tamed, but is stupid and gluttonous in captivity. Its song consists of a weak uncertain whistling, a little resembling that of the thrush, but not so loud. The flesh is said to be delicate.

The American Waxwing or Cedar Bird (*Ampelis cedrorum*) is smaller than the preceding species, to which it is nearly allied. It is found throughout the whole extent of North America between Mexico and Canada, and parties are said occasionally to roam as far south as the forests of Guiana. In the United States it is a resident during the whole year, the northern and middle states being its more usual quarters in the summer season, and the southern in the winter. It builds its nest in trees, and lays three or four eggs. In general habits the cedar bird resembles the Bohemian wax-wing. It is, however, songless, uttering only a feeble lisping call-note. It is excessively voracious, and it becomes so fat in the fruit and berry season as to be sought as a delicacy by epicures. The American waxwing measures 6½ inches in length. In appearance it much resembles the European species, and has similar wax-like appendages to the wings. A third species, differing in the entire absence of the wax-like appendages, is known from Japan.

**WAY.** See HIGHWAY.

**WAYS, ROMAN.** Our old chroniclers give this name to four principal roads which they suppose to have been either originally formed by the Romans in Britain during their occupation of the country, or at least to have been completed by them upon lines already traced and used by the former inhabitants. See the articles WATLING STREET, IKENILD STREET, IRMIN STREET, and the FOSSWAY.

**WAYZ-GOOSE**, a journeyman's outing and feast; a term now tending to limit itself to the "bean feast" of printers and their associated trades. The word *wayz* (now obsolete) means a bundle of straw, and hence a *wayz-goose*

is a stubble-goose, the crowning dish of a feast given by an employer to his workmen at the beginning of the hard work of the winter. But the usual time for a printer's wayz-goose is now in the long days of July and August, as with the other bean feasts of working-men, and the old name has outlasted its original sense.

**WE**, one of the divine trinity of the earliest form of the Norse mythology. Wotan, Wili, and We, grandsons of the self-born Buri, and creators of the world, as we know it, out of the body of the giant Ymir (nature), whom they slew. His progeny of frost-giants (all but one) were drowned in the deluge of his blood, which overspread the whole earth. Wotan (in South Germany Odin) means spirit; Wili, will; and We, holiness. The parallel of these three brothers overthrowing the vast nature-gods is curiously close with the three great gods of Olympus, Zeus, Poseidon, and Hadès, overthrowing the huge Titan dynasty.

After this we do not meet further with Wili or We in especial; the sovereignty of the world passes to the Aes (pillars) under Wotan, the all-father. Of these Aes twelve were pre-eminent (again a parallel with the classical mythology), and all the Aes are children of the three brothers, Wotan, Wili, and We.

**WEALDEN FORMATION**, in geology, a series of sandy and clayey deposits, typically developed in the Weald districts of Kent and Sussex, and constituting the later sediments laid down in a vast estuary occupying southern British areas between the JURASSIC and CRETACEOUS PERIODS. The beds are especially well exposed in the Hastings cliffs, and in the neighbourhood of Tunbridge Wells. They are also seen in the cliffs of Brixton Bay, in the Isle of Wight, and resting upon the PURBECK BEDS in Swanage Bay, Dorsetshire. Clays and shales predominate in the upper division of the formation, which is known as the *Weald clay*, and this deposit is of considerable economic value on account of its furnishing thin beds of the well-known ornamental PETWORTH (or SUSSEX) MARBLE. The lower and largest division of the formation is the *Hastings sand*, in which, as the name implies, the sandy element predominates. A clayey bed of this series, the *Wadhurst clay*, is of interest as inclosing numerous large patches of fossil shells, which have been converted into the valuable iron-ore, hematite. These were formerly much worked, and yielded a considerable supply of the metal from the days of the Romans until about 1838. The hard sandstones of the formation also furnish durable building materials and some road metal.

The fossils of the Wealden beds are almost exclusively of a terrestrial and fresh-water character. Ferns, like *Sphenopteris* and *Alethopteris*, and pieces of *CONIFERÆ* and *CYCADACEÆ* are met with. Among shells there are the bivalves *Unio* (a fresh-water mussel), *Cyrena*, and *Cyclas*, besides the univalves *Paludina*, *Melania*, and others. Crustacea are represented by myriads of the minute *Cypripes*. And the bones and teeth of fishes and reptiles are comparatively abundant. Among fishes there are remains of the shark *Hypodus*, and the strongly armoured ganoid, *Lepidotus*, the rounded teeth and rhombic shining scales of the latter being especially common in some beds. *IGUANODON* is the most striking of the reptiles; but remains of the large carnivorous *MEGALOSAURUS* are also met with, in addition to the bones and teeth of crocodiles and pterodactyles.

The NEOCOMIAN strata of Yorkshire and the Continent are believed to be, in great part, the marine equivalents of the Wealden formation.

**WEALTH** is the subject matter of POLITICAL ECONOMY, but economists have found much difficulty in arriving at a satisfactory definition of the term, and some of late have chosen to abandon the word altogether. But, as Professor Bonamy Price justly observes, "wealth is the word which belongs to the world which political economy

addresses," and the popular interest attached to it is a sufficient reason for retaining it. Besides, as Mr. J. S. Mill says, "every one has a notion, sufficiently correct for common purposes, of what is meant by wealth. The inquiries which relate to it are in no danger of being confounded with those relating to any other of the great human interests." As Adam Smith points out, wealth and money were often regarded as synonymous terms, and it was upon this fallacy that the so-called "Commercial System" which he exploded was founded.

Mr. F. A. Walker suggests a definition which, if not exhaustive, has at least the merit of brevity: "Wealth comprises all articles of value, and nothing else." If anything have not value [see VALUE] it does not belong to this category. It may conceivably be better than wealth; but it certainly is other than wealth. In the language of Professor N. W. Senior, "the words wealth and value differ as substance and attribute." All those things, and those only, which constitute wealth are (economically speaking) valuable.

**WEASEL** (*Putorius vulgaris*) is a carnivorous mammal belonging to the family MUSTELIDÆ. The weasel is widely distributed over the temperate and northern parts of both hemispheres, except the extreme north. It is smaller than its near ally, the ermine or stoat, measuring about 8 inches in length, exclusive of the tail, which measures another 2 inches. The body is extremely elongated, and almost regularly cylindrical throughout its length; the neck is very long, and the legs very short. The head is large and flattened; the eyes are small, round, and black, and the ears are small and rounded. The upper parts, legs, and tail are reddish-brown; the throat and belly are white. In northern latitudes there is a similar, but less marked, change of colour in winter to that observed in the ermine, the brown parts becoming almost white. Mice, rats, voles, moles, and birds form its ordinary prey, though it will also attack hares and rabbits, plunder birds' nests of their eggs, and, under stress of hunger, rob the poultry-yard of chickens and young ducks. In spite of the last-named depredations, its services in destroying mice and rats entitle it to more consideration at the hands of the farmer than it usually receives. Its activity, wariness, and courage are proverbial. It climbs walls and trees, and takes freely to the water in pursuit of its prey. Night is generally the time of its activity. Small as it is it will attack dogs and even men when its nest is invaded. This is framed of dry leaves and herbage, and is generally lodged in some snug locality, such as a crevice in a bank or old wall, the hollow of a tree, &c. The young are four or five in number, and there are two or even three litters in the course of the spring and summer. The generic name *Mustela* is sometimes given to the weasel and its allies, but this more properly belongs to the MARTENS.

**WEATHER** is a term used to denote the state of the atmosphere with respect to heat or coldness, dryness or humidity, wind, rain, &c.

In some countries the variations of the atmospherical phenomena occur in an order which is nearly constant; and in those regions predictions concerning the weather for several days, and even for months to come, may be made with almost a certainty that they will be verified by the event. Thus along the shores of Malabar there is a clear sky from September to the following April, and on the coast of Coromandel the fair season continues from April to September; while during each following six months, in the two regions, it rains almost incessantly. Alternations of fair weather and rain also take place regularly in the interior of Africa and South America. But in insular situations generally, and in Europe and North America particularly, the winds, varying in direction and intensity according to no known constant law, mingle together at irregular intervals of time the masses of air which abound



with vapour raised from the ocean, and thus cause clouds to cover the horizon, and showers of rain, hail, or snow to descend. The wind which is most prevalent at any one place, when it begins to blow, generally affords an indication of the kind of weather which may be expected; but sometimes no circumstance occurs by which a change can be predicted even a few hours before its occurrence, especially in the British Islands, the principal cause of this uncertainty there being the proximity of the country to the Atlantic. Storms chiefly advance from west to east. [See the account of the cyclones or rotatory storms in the article METEOROLOGY, section *Weather Telegraphy*.] While in Norway and the Baltic and places towards the east of Europe the weather may be predicted for a considerable time, since each storm as it appears in the west may be preceded in its course by the telegraph, it is evident that England is at a great disadvantage in respect to such timely warning. In America also gales and unsettled weather are predicted at the seaboard in the east some days beforehand. It is by the study of the barometer and the direction of winds prevailing in different parts of Europe, as telegraphed from various countries, that the surest indications of the coming weather are obtained in Great Britain. It has been observed that most, in fact nearly all, the weather changes of Europe begin from the south-west, and pass over to the north-east, and that unsettled or bad weather is accompanied with a low barometer, whereas elsewhere the barometer is higher. Supposing, then, that the weather telegrams inform us that everywhere in Europe barometers are high, we may safely conclude that no storm need be feared for two days at least. But if on the next morning the barometer falls slightly in the west of Ireland, and an eastern wind begins to blow over Great Britain and Norway, and a south-east wind over France, then, as the winds blow towards the lowest barometer, or rather a little to the right of it, we may presume that a storm, more or less severe, is coming, the centre of which is likely to pass over England. Should the winds remain in about the same direction, or veer slowly towards the south and west, while increasing in force, and a rapid fall in the barometer is noticed in the west of Ireland, a great storm is portended, and the various seaports are immediately notified by telegraph of its approach. If, however, the winds do not increase in force, and the barometer fall but slightly, or cease to fall, we may conclude that the storm has either passed very much to the north of Britain, or that no immediate danger need be apprehended. The immense cost attending such a system of telegraphing, however, would deter any individual or company from undertaking its responsibility; but as the information is of national importance to these islands, considering the tremendous interests we have on the sea, it is natural we should look to government to provide the means of supplying the necessary intelligence. For this purpose the late Admiral Fitzroy was appointed by the Board of Trade as chief of the meteorological office. His duty was to receive every morning from the outposts particulars of the weather prevailing there, and from these reports, and a study of the instruments in his own office, to make forecasts of the weather for the next two or three days. These deductions were sent every forenoon to the *Times* for publication in a second edition, and when betokening danger were transmitted by signals to numerous stations on the coast. In this way he predicted the great storm in which the *Royal Charter* was wrecked in 1859. Out of 100 forecasts it has been ascertained that an average of about eighty-five were correct. The system was abandoned for a time at Admiral Fitzroy's death in 1865; it has since been resumed under the control of the Royal Society, and has now arrived at an extraordinary state of perfection. Every day a forecast of the weather is issued in all the principal journals, which is nearly always correct,

and is of the greatest possible use for purposes of business or pleasure. The following is a specimen taken from a daily paper, and precisely verified by the result.

The forecasts of weather for this day were issued from the Meteorological Office at 8-30 p.m. yesterday:—

DISTRICTS.	FORECASTS.
0. Scotland, N.	Easterly winds, light to moderate; cold, hazy.
1. Scotland, E.	
2. England, N.E.	
3. England, E.	
4. Mid. Counties.	Easterly airs; foggy, cold, clearer later.
5. England, S. (London and Channel).	
6. Scotland, W.	
7. England, N.W. and N. Wales.	North-easterly breezes, moderate or light; fair, cold.
8. England, S.W. and S. Wales.	Easterly breezes, light; fair.
9. Ireland, N.	Easterly and north-easterly winds, moderate or light; fair, cold.
10. Ireland, S.	

*Warnings.*—The signals hoisted last evening were lowered this afternoon.

See METEOROLOGY, section *Weather Telegraphy*, and see also the Plate illustrating that article.

The periodical changes of the moon's phases often coinciding with changes in the phenomena of the atmosphere, it was very natural that the latter should, by many persons, be thought to have some dependence on the former; an opinion apparently strengthened by the known fact that the tides of the ocean and atmosphere are produced by the attractions which the moon and sun exercise on the particles of water and air; and there have not been wanting men who have formed tables in which the probable state of the weather is stated in connection with the hour of the day or night at which the new ... 3 full moons take place. In order to test the real value of the lunar changes on the weather, the Greenwich observations of fifty years have been carefully examined, and it is found that the number of instances in which the weather was in accordance with the prognostication was one less than those in which it was not. Thus, when brought to the test of accurate examination and figures, the theory of the moon's changes on the coming weather is proved to be a complete delusion. Until a more generally diffused knowledge of the laws of nature, however, it is very likely the theory will continue to be believed, prejudice going a long way towards assisting people to forget the unsuccessful prognostications in favour of those happening to occur as predicted.

There are two or three indications of rain or fair weather upon which some reliance may be placed. The clouds in the west being red at sunset, with a tinge of purple, portend fair weather, because the air when dry refracts more of the red and heat-making rays than when moist; a coppery or yellow sunset foretells rain. But, as an indication of approaching wet weather, nothing is more certain than a halo round the moon, since it is produced by precipitated water: the larger the circle the nearer are the clouds; consequently, the more ready to descend in rain.

A rainbow in the morning betokens rain, and one in the evening fair weather; because the bow can only be seen when the clouds depositing the rain are opposite to the sun; thus in the morning the bow is in the west, and in the evening in the east: and as the rains in this country are usually brought by westerly winds, a bow in the west indicates that the rain is coming towards the spectator; whereas a bow in the east indicates that the rain is passing away from him.

The indication of fine weather from swallows flying high, is explained by the fact that the insects on which these birds feed delight to fly in a warm stratum of air; and when the warm air occupies a higher part of the atmosphere the birds find their prey in the upper regions. On the contrary, when the warm air is near the surface of the



earth, the insects and birds are there also; and then, as the cold air from above descends into it, a deposition of water takes place. The reason why sea-birds come to land previous to a storm is that, as the fish upon which the birds prey go deep into the water during storms, the birds come to land merely on account of the greater certainty of finding food there than out at sea.

**WEATHERCOCKS** or **VANES** are of great antiquity. Their English name is derived from the once universal use of the cock for church vane, partly because of the practical use of the outspread tail to catch the wind, but more especially because of the symbolism of the bird's proverbial watchfulness, as showing the perpetual care of the church; also by its reference to the sin of St. Peter. The parishioners were always reminded when they looked to see the course of the wind of the danger of denying their Master and his teachings, which constantly beset them in their daily life. The usual vane in domestic buildings, in mediæval times, was a banner, not a cock. The usual modern vane is an arrow.

Many churches have for a vane the emblem of the saints to whom they are dedicated. Of such are St. Peter's, Cornhill, London, with its great key; St. Lawrence, of Norwich, with its gridiron, &c.; St. Michael's, Queenhithe, London, once the great corn-market by the river, has a ship, the hull of which will contain just a bushel of corn. The grasshopper, 11 feet long, which surmounts the present Royal Exchange, London, and is a relic of the old Royal Exchange, is the crest of Sir Thomas Gresham, its founder. Mother Shipton prophesied that when the dragon of Bow (the weathercock of Bow Church, Cheapside, also 11 feet long) should meet the grasshopper of the Exchange, London streets should run with blood. Probably the old witch thought the conjunction impossible. Nevertheless the two actually lay together for some time in a stonemason's yard in Old Street Road, in 1829, during rebuilding and repairs, yet London remained as peaceful as usual.

**WEATHERING OF ROCKS.** When rocks are exposed at the surface, they become subjected to the effects of wind, rain, and alterations in the temperature of the air, which all tend towards their disintegration. This is technically known as the process of *weathering*, and nearly all the minor features of scenery result from this sculpturing action. The different rocks when forming crags and hills are thus differently shaped according to their structure and mineral characters. Weathered granite, for example, occurs mostly in the form of piles of quadrangular blocks, owing to its peculiar tabular jointage, and the lines of weakness afforded to the disintegrating agencies by these cracks. The natural fissures in basalt are of such a form that between them the pieces of rock become weathered in a curious manner, giving exposed surfaces the appearance of heaps of cannon-balls, these, however, readily splitting into concentric shells. Limestones and certain sandstones give rise to crags with almost parallel sides, and the former are always much fretted, owing to the solvent action of carbonic acid. Soft chalk produces round-topped hills and undulating slopes; and every modification of these various rock-types has its own scenic effect.

**WEAVER-BIRD** (*Ploceidae*) is a family of Passerine Birds, so called from the elaborately woven hanging nests which they construct. The species are numerous, and are distributed over the warmer parts of Africa and India, extending to the Malayan Peninsula. They are small birds with a strong conical, slightly curved bill. One of the best known is the **BAYA-BIRD** (*Ploceus baya*) of India. The Madagascar Weaver-bird (*Ploceus penalis*) is of the size of our common sparrow, and of a green colour, with the head and throat yellow, the belly gray, the vent red, and the gull-feathers black. This bird builds its nest

usually at the extremity of the leaves of a tree on the bank of a rivulet, composing it of straws and rushes, neatly interwoven into the form of a pouch, from one side of which there hangs a long cylindrical tube, serving as a passage to the nest, the opening being, as usual, at the bottom. This bird has the curious habit of returning year after year to the same spot and building a new nest attached to the bottom of the old one, so that as many as five nests may be seen thus placed one below the other. They are very sociable in their habits, as many as five or six hundred nests being sometimes suspended from a single tree. The Social Weaver-bird or Social Grosbeak (*Ploceus socius*), a native of South Africa, lives in vast societies. It is nearly 6 inches in length, and of a grayish-brown colour, paler or yellowish beneath; the face and throat are black, and there are numerous black spots on the flanks. These birds construct an enormous assemblage of nests under a common roof, placed among the branches of a tree; the roof is formed of a vast mass of herbage closely interwoven, so as to throw off the heaviest rain, and the separate nests or chambers occupied by the birds are attached to the lower surface and sides of the general mass, which are perforated all over with the small apertures through which the birds obtain access to their dwellings. It is said that the birds construct new chambers every year, so that the mass of materials becomes so great as sometimes to cause the destruction of the tree.

**WEAVING**, the art of interlacing threads or yarns of any substance in such wise as to produce an unbroken web, has been known from very early times. In what country, or by whom it was invented, we know not, but we find it practised with great skill by the people of ancient Egypt at a very remote period of their history. The Egyptian looms, as depicted on tombs at Thebes and elsewhere, were of very simple construction, but they sufficed to produce fabrics that were very beautiful and costly, and even in the most ancient mummy cloths the texture is close, firm, and elastic. Weaving was also practised very early in India, and the Hindus have ever been famous for their proficiency in the art. It was known to the earliest of the Greeks, and Homer describes as the product of Creüsa's shuttle a figure-woven pattern, in which appeared a gorgon and dragons. The damasks, shawls, and tapestries woven by the later Greeks and Romans would rival in beauty some of the best productions of modern art. The Hebrews seem to have learned the art from the Egyptians, and we find numerous references and allusions to it in the books of the Old Testament. In more modern times the people of Italy and of the Netherlands appear first to have become famed for their textile manufactures, and from them the trade passed to England and France. Edward III., and afterwards Elizabeth, are said to have given such encouragement to the art as to lay the foundation for that prominence in textile manufactures for which England is still distinguished.

The simplest form of weaving practised is that used by some savage tribes in mat-making. In this a number of fibres, generally vegetable, are arranged side by side, each end being tied to a stick, and the sticks being fixed so as to keep the fibres straight and on the same plane. The workman then ties a thread to the outermost fibre, and, lifting up every other of the longitudinal threads, he passes it through to the other side, continuing the process until the mat is finished. This was most probably the way in which the art was first practised, and it may have been used thus for a long time before ingenious inventors devised methods of spinning yarn so as to obtain longer threads, and devised shuttles to improve upon the clumsy lifting with the fingers.

Weaving is effected by means of a loom, formerly worked by hand, but now mainly by steam power. A loom consists essentially of two rollers, between which is stretched

a large number of threads forming the *warp*. Suspended from the top of the loom are two frames, or *heddles*, which can be raised by means of a treadle. One of these heddles is connected with and raises all the alternate threads of the warp, while the other raises all the other threads. If the threads of the warp are very numerous, there are several heddles, divided into two groups, all the one group being raised at once, and all the other group at once. By means of a *shuttle*, or elongated case containing a bobbin of thread, a thread is thrown through the warp, when all the odd-numbered threads are raised, and back again, when all the even-numbered threads are raised. The warp threads are thus fastened together by this cross-thread, or *weft*, which passes under one warp thread and over the next, and so on. The threads of the weft are driven together by means of a framework termed a *batten*. Formerly, in the hand-loom, the shuttle was thrown and the batten worked by hand, the heddles being raised by a foot treadle; but in power-loom, introduced about 1807, these operations are effected automatically, the main duty of the weaver being to change the shuttles when they are empty.

*Pattern-Weaving.*—Pattern-weaving has many varieties, in which different colours are combined by weaving. If all the threads of the warp are of one colour, and all those of the weft another colour, it produces the peculiar effect called *shot patterns*. A stripe is a pattern in which parallel lines run either along or across the warp; while a check is an alternation of rectangles like a chess-board, or more properly like the varieties of Scotch plaid. The production of a stripe depends either upon the warper or the weaver: the production of a check depends upon both. [See CHECK.] In the twill, which includes satin, bombazine, kerseymer, &c., the weft-threads pass over one warp-thread and under two, over one and under three, or over one and under eight or ten, according to the kind of twill; the effect of this is, to produce a kind of diagonal ribbed appearance, either on the "right" or the "wrong" side of the cloth, and a smooth and glossy appearance on the other, according as the one thread is crossed above or below by the weft. [See BOMBAZINE.] To produce such results, more than two sets of heddles are required, and more than two treadles to work them; and the weaver's loom is a much more complicated machine than that for plain-weaving.

When, instead of or in addition to a twill, the weaver has to produce sprigs, flowers, spots, or any kind of figure, a great increase of complexity obtains. The weft may pass over four and under one at one part of the width of the cloth; over two and under two at another; over one and under four at another, according to the part of the figure which may happen to occur at any particular part of the width of the cloth. The complicated movements thus rendered necessary gave rise to the invention of the draw-loom, in which strings are so arranged that a boy can draw down the requisite warp-threads preparatory to the movement of the shuttle. Early in the present century two inventions were made with the view of rendering the draw-loom more automatic. One of these, called the *draw-boy*, not only superseded the necessity of employing a boy to pull the handles, but removed, by the unerring certainty of its operation, all possible chance of mistake in pulling the wrong handle. The other was the *automatic carpet-loom* of Mr. Duncan, in which the threads were moved by pins inserted in a rotating barrel, somewhat on the principle of the musical box.

But the draw-loom, the draw-boy, and the barrel-loom have been alike eclipsed by the exquisite apparatus of M. JACQUARD. This, indeed, is not a loom, but an appendage to it, intended to elevate or depress the warp-threads for the reception of the shuttle. A hollow prismatic box has its surface pierced with a great number of holes, and

to each face of the box is fitted a card, also perforated, or rather, for each particular pattern to be woven there are a large number of cards, all of equal size, and equal in size to each face of the box. The perforations in the cards, where they occur, are correspondent in position with some of the holes in the box, but in almost every card the holes are fewer in number than those on each face of the box. All the cards are linked together by hinges or joints in such a manner that as the box rotates on a horizontal axis the cards in succession lie flat on the several faces of the box. The cards for one pattern may be 100 or more in number, and all form an endless chain. The box may have four, five, or more faces, according to circumstances. The principle of action depends on the arrangement of a number of bars in front of the box, which bars are permitted to enter or not to enter according as they happen to meet or not to meet with perforations in the cards; and this inequality of action influences the leverage power by which the bars move the springs.

The Jacquard machine is now largely used in the more elaborate kinds of weaving, but it has the drawback of requiring a serious expense of material and time in the preparation of the cards required, more especially in the heaviest work, in which the cards have to be made of sheet iron. An elaborate damask design may require as many as 4000 cards and 400 needles, and as many as 20,000 cards have been employed in one design, the preparation of which would represent a man's labour for a whole year. To reduce this labour and expense an improvement has been introduced in which a sheet of prepared paper, punctured with the proper apertures, is substituted for the cards, this paper being in the form of a continuous band, only three-fourths of an inch wide. The arrangement is also such as permits the 400 spiral springs in connection with the needles in the old machine to be dispensed with. Thus the wear and tear due to the resistance of these is done away with, and fine and light wires are introduced in lieu of the heavy ones previously employed. Another invention is that known as the electric-loom, first introduced by M. Bonelli in 1851, and which has since been greatly improved. In this the cards of Jacquard's apparatus are superseded by an endless band of paper covered with tinfoil, intended to serve as an electrical conductor, the unperforated portions of the cards being represented by non-conducting patches of black varnish, laid on with a brush. The band passes steadily along under the points of metallic rods or teeth. Each of these teeth connects with a small coil or helix, within which is a soft iron bar. A frame capable of swinging slightly is situated in front of the ends of these bars, having a plate in it perforated with a corresponding number and order of holes, within and through which as many iron rods abutting at one end against the bars already named can move with a little friction, like as many piston rods through stuffing-boxes. The tinfoil band being put in connection with a galvanic battery, with the other poles of which the remote ends of all the helices connect, all the metal teeth at a given time resting upon the bare foil conduct portions of the current, render the bars in their helices magnets, and by their action withdraw the corresponding rods out of the plate, leaving so many holes open while the rods answering to the teeth that are on the varnished portions of the foil remain in and close the other holes. In this way this single plate is made to serve for the endless succession of Jacquard cards, the needles entering these holes determining as before what warp-threads shall be raised. By means of insulated strips of foil running along the back of the tinfoil band, and connected with certain portions only of its face, separated by narrow insulating breaks, different colours or sorts of weft can be alternated in the piece, according to the strips of foil successively put in connection with the battery.

**Double-Wearing.**—In all the fabrics hitherto noticed there occurs but one layer of threads, formed by the intersection of the weft among the warp, both weft and warp being individually single. But there has long been practised the weaving of a kind of double cloth, composed of two webs, each consisting of separate warp and weft, but both sets interwoven at intervals. The junction of the two webs is formed by passing each of them occasionally through the other, so that each particular part of both is sometimes above and sometimes below. See **CARPET**.

**Cross-Wearing.**—Gauze and bobbinet may be taken as the chief representatives of this kind of fabric. The former has been already slightly noticed [see **GAUZE**], and we shall here glance rapidly at the latter. Net is the generic name for these goods; and according as slight deviations were made in the mode of crossing the threads, so were distinctive names given to the material produced, such as whip-net, mail-net, patent-net, drop-net, spider-net, Paris-net, balloon-net, &c. All these varieties are produced at the loom, with warp-threads stretched horizontally, and weft-threads thrown across by means of a shuttle; and the difference between them depends on the manner in which the warp threads were made to cross one another, and in which the weft-thread was thrown. In the bobbinet of later times, however, the interlacing is produced by a machine very different from the common loom, and among the most remarkable which our textile manufactures afford. From 1777 to our own times repeated improvements have been made in this most ingenious invention.

The main points of difference between the bobbinet machine and the common loom may be thus stated. In the former the warp-threads are vertical, in the latter they are horizontal. In the former the weft is wound on a brass bobbin so thin as to pass between the adjacent threads of the warp; in the latter it is contained in a shuttle an inch or more in width. In the former the transit of the weft-thread, while passing between the warp, is at right angles to the plane of the web; in the latter it is parallel with that plane. In the former the successive meshes or intersections are driven up close to those before made, by a series of pointed wires catching in the loops; in the latter they are driven up by the lay or batten. In the former there are sometimes as many as 3000 bobbins or weft-carrying implements to one machine; in the latter there are seldom more than one or two shuttles. In the former each bobbin twists its weft-thread round a warp-thread by a series of oscillatory movements like those of a pendulum; in the latter the twisting is effected rather by the movements of the warp than those of the weft.

**Chain-Weaving.**—We may apply this term to a mode of using threads in which a series of loops is formed by a continuous thread, each loop or link being so connected with others as to form a kind of chain; and this chain-work may either be worked upon a ground woven at the loom, or may constitute the woven material itself. Sampler work, lace-running, tambouring, pillow-lace, rug-work, Berlin work, tapestry—all may be regarded as varieties of chain-work.

The manufacture of stockings, whether by the humble process of knitting or by the use of the stocking-frame, is in strictness to be called chain-weaving; for the fabric itself is produced by a series of links or loops in a thread of worsted, cotton, or silk. In the process of knitting, which is still carried on to some extent in certain districts, plished steel needles or wires are used to link threads together into a series of loops, closely resembling in their character the loops produced in tambouring. But this method has been almost entirely superseded by the ingenious stocking-frame, for an account of which see **Hosiery**.

The common stocking-frame exhibits a quadrangular arrangement of upright posts, connected by cross-pieces

at the top, and having on one side an additional piece of framing to support the weaver's seat. Near where the weaver sits is placed a series of needles, which serve the place of knitting-needles in forming the loops; they are not straight needles, nor yet what would be termed hooks, but something midway between the two; and the number depends on the coarseness or fineness of the stocking. The frame is provided with a series of vibrating levers called *jacks*, and these, aided by other intricate apparatus, throw the stocking-yarn into such curvatures as to enable the needles to form the loops. The weaver has a bobbin of yarn at one side of his frame, from which he unwinds enough to lay across all the wires; he then, by moving certain treadles with his feet and levers with his hands, forms this length of yarn into a row of loops; and at the next movement, when forming another row of bends or loops, he links the one row into the other, so as to form a kind of chain, which chain, extending both lengthwise and across, constitutes the web of the stocking. Machines have been invented which will enable a workman to produce twelve stockings at once.

**Pile-weaving.**—If we examine velvet, fustian, velveteen, moleskin, doeskin, or a Turkey or Wilton carpet, we shall find that in all of these fabrics the warp and weft threads are almost concealed by a kind of down, nap, or pile, which imparts a peculiarly soft and smooth texture to them. Fustians are, in fact, a kind of cotton velvet, as Turkey carpeting is a woollen velvet. A few details of this kind of weaving will be found under **CARPET**, **FUSTIAN**, **VELVET**.

**WEBBE, SAMUEL**, one of the chief glories of the only form of the musical art in which England stands quite unrivalled, in fact, quite alone—namely, the *glee*—was born in Minorca in 1740, the son of a government official. The sudden death of his father left Webbe's mother very poor, and the lad was sent out to earn his living as a cabinetmaker. At the end of his apprenticeship he left his trade for the profession of music, and quickly made himself a name for charming unaccompanied vocal compositions. At that time the Catch Club was giving prizes and medals for good glees. His first prize was won in 1766, with "Oh, that I had wings," a canon, and in subsequent years was followed by twenty-five other prizes in all.

There are few lovers of our best English music—and there should be none—who do not know and cherish Webbe's best works, such as "Discord, dire sister" (prize 1772), "When winds breathe soft," "The mighty conqueror," "Would you know my Celia's charms" (catch), &c. Nothing is more graceful, more delicately refined, and appropriate to the sentiment than the music of these and many scores of other glees of Webbe's. He succeeded Horne as secretary to the Catch Club in 1784, and on the establishment of the Glee Club, in 1787, was elected its librarian, writing as his inauguration piece the delightful trio, "Glorious Apollo," which so charmed the members that ever afterwards it was sung as the commencement of each evening's programme. There are nine books full of Webbe's glees, a treasure-house of pleasant harmony. Webbe was much respected and beloved. At his death, in 1816, the members of the club competed in setting an ode to his memory, and among the competitors was Lord Burghersh (afterwards Lord Westmorland), the founder of the Royal Academy of Music.

**SAMUEL WEBBE, Jun.**, the son of the preceding (1770–1843), was also an excellent writer, especially of a rather florid kind of hymn-tune, with little points of imitation and the like. The present severer style of church music has superseded these, but they have a very good effect when well performed. His best glee is "Come away, death." He was several times a prize-winner at the Catch Club.

**WEBER**, a practical electro-magnetic unit of current (one-tenth of the absolute unit), so named after a distinguished electrician, is now usually called **AMPERE**.

**WEBER, CARL MARIA FRIEDRICH ERNST FREIHERR** (i.e., Baron) **VON**, the great musical composer, was born at Eutin in Holstein, 18th November, 1786; so at least it is stated on the tablet placed against the house where he was born, and the date is corroborated by the baptismal register. The 18th of December is, however, the date usually kept as Weber's birthday. He died of consumption in London, 6th June, 1826. Weber was the cousin of Mozart's wife (Constanze Weber). Edmund, a brother of Carl Maria, was born in 1782, and obtained some repute as a violinist, produced one opera, and published some instrumental music. But, indeed, all Weber's family seem to have been excellent musicians right back to Johann Baptist, created first baron in 1622. The family's frequent change of residence during Carl's early years (as his father directed a dramatic troupe principally composed of his own elder children) was most unfavourable to his studies; and his own reserved disposition, which prompted him to shun his schoolmates, and devote himself to music in play-hours, was as prejudicial to his physical development. In the latter we may trace the germ of that melancholy which is said to have been habitual to him in after-life; and in his irregular education we may find a cause for much that is unsatisfactory to the careful critic in his music, as well as the source of that keen eye for powerful stage effect which serves him to attain his highest flights. His first steady instruction in his art he received from an organist named Heuschkel at Hildburghausen, whither his father removed in 1796. He was next placed under the care of Michael Haydn at Salzburg (brother of the great Joseph Haydn), who seems to have had little congeniality with the young student, and accordingly to have exercised little influence upon him. Weber published, however, his first work, "Six Fugues for the Pianoforte," in 1798, while he was Haydn's pupil. Before the end of the same year the family removed to Munich, and there Weber (under Kälcher) was indefatigable in his labours, and wrote an opera, "Die Macht der Liebe und des Weins," some masses, sonatas, and other pieces, which never came before the public. He always had an inclination for drawing, which was so strong that this art long divided his attention with music; and when, in 1799, Sennefelder published his discovery of lithography, Weber was greatly attracted by it, threw his whole energy for a time into its investigation, and devised some modifications of the process, which he fancied would entitle him to rank with the original inventor. He soon, however, returned with renewed ardour to his musical studies, and in November, 1800, made his first public essay as a dramatic writer, in the opera of "Das Waldmädchen," which was played at Freiberg with success. He went to Vienna in 1803, and became the pupil of Vogler, with whom he remained for nearly two years. In 1804 he obtained an engagement as music director of the theatre in Breslau, where, young as he was, he acquired the character of an excellent conductor. He gave up his appointment in 1806, and became musical secretary to the Duke Eugene of Würtemberg. In 1807 his patron's brother, Duke Ludwig, brother of the King of Würtemberg, engaged Weber, who was at this time pressed for money, as his private secretary, and with him he resided for some time at Karlsruhe, his official occupation leaving him leisure to continue his musical work. He rewrote his opera as "Sylvana," and also composed "Der erste Ton," a dramatic cantata. He offended the king, and was banished from Würtemberg in 1810. He now became much distinguished as a pianist. In this capacity he made a successful tour in 1809, which he closed at Darmstadt, where Vogler was then living. Vogler always powerfully influenced him, and wholly for good; and

among his fellow pupils at Vogler's was Meyerbeer. With him and Gottfried Weber a musical association was formed, which was afterwards taken by Schumann as the mould of his famous "Davidsbündler." He produced his characteristic little operetta of "Abu Hassan" in 1811, with considerable success. During the next year he visited the chief capitals of Germany, augmenting his reputation as a player; and in 1813 he was appointed director of the opera at Prague, with the charge of organizing a new orchestra. His success as a conductor was most remarkable. It was now that he composed his four-part songs for male voices, to Körner's patriotic series of poems, "Leier und Schwert," which had an immense popularity and not a little political influence, and were the first things that brought their composer's name into general repute. In 1815 he produced his cantata, "Kampf und Sieg," in celebration of the battle of Waterloo. He gave up his post in 1816, and then spent two years at Berlin, where he wrote three of his well-known pianoforte sonatas. In 1818 he was engaged to share with Morlacchi the office of kapellmeister in the court theatre at Dresden; Weber having the direction of the German operas, and his co-adjutor of the Italian. One of his first duties in this appointment was to compose a mass in honour of the fiftieth anniversary of the accession of the King of Saxony, and his well-known "Jubilee Overture" was written for the same occasion. The melodrama of "Preciosa," with Weber's exquisite music, was brought out at Berlin, 11th March, 1820, and still remains a standard work on the German stage.

The 18th of June, 1821, was rendered notable in the annals of dramatic music, by the first performance of "Der Freischütz," to the enormous success of which opera, and its great influence upon the art, Weber mainly owes his high reputation. The work was projected in 1817 by the composer and his friend, F. Kind, the author of the libretto; and they laboured, with common zeal, at their design of embodying in a work of art one of the most popular of the German legends. Weber was very exacting as to the conduct of the story, and required the poet to rewrite the last finale many times. The overture was publicly played some time prior to the production of the opera, and stimulated general interest in the work, which was reserved for the opening of the new Königsstadt Theatre in Berlin. Its brilliant reception has been, in some degree, ascribed to the resistance of the opposition of Spontini's supporters by the partisans of German music. Its production in London opened a new era in the lyrical drama, and the present advancing condition of the English opera may distinctly be traced to the effect of this emphatically national work upon the public mind. The famous "Concert-Stück," for pianoforte and orchestra, was completed on the very day of the production of "Der Freischütz." His second grand opera, "Euryanthe," the splendid music of which is weighed down by an insufferably tedious libretto, and is consequently never heard except in the concert-room, was produced with moderate success at Vienna, 25th October, 1823. The popular rage for the "Freischütz" in London, made Charles Kemble desirous to produce an original work of the composer at Covent Garden Theatre, of which he was the proprietor. Sir George Smart, his musical director, made arrangements with Weber, who took Wieland's poem of "Oberon," which Planche translated into English, as the subject of a new opera. With characteristic thoroughness he learnt English before he would definitely write the opera, because he should then be able fully to take in the meaning of the scenes. He arrived in London with "Oberon" on the 6th of March, 1826. His first public appearance was to conduct the music of the "Freischütz" at the oratorios, given alternately at Drury Lane and Covent Garden theatres, on the Wednesdays and Fridays in Lent. He subsequently conducted at the Philharmonie

concerts, and he gave a benefit concert of his own. "Oberon" was first played on the 12th of April, and ran for twenty-eight nights. Weber conducted the first twelve. The music is very fine. Weber was now seriously ill, and desired to immediately return to Dresden. He delayed only on account of a performance of "Der Freischütz," announced for his benefit at Covent Garden on the 6th of June, but which he did not live to witness, as he died the day before. He had been warned before coming to London that it might kill him in his weak state of health, but he held to his word, and, besides, he was morbidly anxious to provide for his family. He had married Caroline Brandt, an actress, in 1817. He was interred in Moorfields Catholic chapel. In 1844 his remains were exhumed by his son and removed to Dresden. An autobiographical sketch, a powerful romance named the "Life of an Artist," together with several occasional essays (some of which had appeared anonymously in the *Cecilia*) and some letters of his writing, were published after his death. Weber's pianoforte playing was characterized by singularly great variety of colouring; and another feature of his execution was his facility in making rapid leaps of very wide intervals. As a composer, he is remarkable for strongly original phraseology and novel employment of harmony; for graphic illustration of scenic action; for rushing energy, the effect of which no hearer can resist, and for vigorous and most brilliant instrumentation, both in his writing for the orchestra and for the pianoforte. On the other hand, his weakness consists in the fragmentary nature of his melodies, in the incompactness of his designs, except in the case of certain of his best works, which are justly accounted masterpieces, but appear to have been produced rather by inspiration than from habitual command of artistical resources; and finally, in the enormous discrepancy between his really fine and his less successful compositions, which latter are worse than anything ever written by a musician of his powers. He carried to a greater extent than any one that wrote before him the system of incorporating in his overture the chief themes of the entire opera; and he was the first to break through the continuous form of the dramatic aria, and by frequent change of movement, alternating rhythm and recitative, to identify the scena throughout with the business of the stage. His influence upon other composers has been very great.

**WEBSTER, DANIEL**, the American orator and statesman, was born 18th January, 1782, in the township of Salisbury, New Hampshire. His father was a backwoods farmer who had previously been a hunter and soldier, and Daniel owed his first education to his mother, a woman proud of and ambitious for her children. Later, in the intervals of farm work, he picked up a little instruction from a migratory village school, and at the age of fifteen his father made some generous sacrifices to send him to Dartmouth College, where he remained four years, studying assiduously in the summer, and during winter teaching school to make out his allowance. He entered the law, and rose rapidly in his profession. He at first took rather less than his share of the interest in politics usually manifested by rising young American lawyers, but in 1812 the declaration of war created a demand for the best talent in the country, and Webster, who had already established a commanding reputation, was elected to Congress. He took his seat in the special session of May, 1813, and in the organization of the house was placed on the committee of foreign affairs. His maiden speech was delivered on the 10th of June, 1813, when he moved a series of resolutions on the Berlin and Milan decrees, and proceeding as it did from a person almost wholly unknown at Washington, it took the house and country by surprise by its display of rhetorical power and wealth of historical knowledge. His subsequent speeches on the increase of the navy, which he warmly

recommended, and the repeal of the embargo, placed him in the first rank of debaters. Having been again, in 1814, returned as a representative to Congress, he removed to Boston in 1816, and, after having powerfully contributed, in 1817, to reform the currency system of the States, he retired for a time from political life to devote himself to his profession. For nearly seven years afterwards, with a single exception, he filled no public office, but as an advocate and counsellor he achieved a position above which no one has ever risen in the United States. His strongest powers were displayed in arguing points of constitutional law, and his achievements in this direction drew upon him the attention of the whole country. In 1820, on the celebration of the bi-centenary of the landing of the Pilgrim Fathers, he delivered an oration which added greatly to his fame as a powerful speaker; and this was but the first of a series of performances, apart from the efforts of the senate and the bar, by which he placed himself at the head of American orators.

In 1822 he was elected by Boston to Congress, and again in 1824 and 1826. At the beginning of 1828 he was chosen senator for Massachusetts. In January, 1830, he delivered a speech in favour of federalism, which made a great sensation throughout the Union, and which was more widely circulated throughout the country than any that had ever preceded it. Webster was strongly opposed to the nullification movement of Calhoun and the South Carolina school, and his eloquence was only less efficacious than Jackson's practical energy in extinguishing the attempt then made by a single state virtually to secede from the Union. In 1839 he paid a hasty visit to Europe, and received great attention in this country, where he formed an intimacy with Lord Ashburton, afterwards useful to both countries. In 1836 he was an unsuccessful candidate for the presidency, but in 1841, on the election of General Harrison, he became secretary of state, retaining the office until 1843. The chief event of this period was the negotiation of the famous Ashburton treaty with England, which was equally advantageous and honourable to both parties. Webster generously supported Clay's candidature for the presidency in 1844, and was himself disappointed of nomination in 1848. In 1845 he was re-elected to the Senate, and in the struggles as to the admission of Texas and California he adopted strongly the northern or anti-slavery side. Afterwards, however, when public excitement had reached a dangerous height, he supported a policy of compromise, and in March, 1850, he made a speech in defence of the fugitive slave law. The same year he was appointed a second time secretary of state, and was in possession of the office when he died at his residence of Marshfield, 24th October, 1852.

Webster's guiding principle in politics was the preservation of the Union, for which he was ready to make all sacrifices, opposing the nullifiers on the one hand, and the abolitionists on the other. He was twice married, and his private character was irreproachable. He possessed a fine physical development, and was always fond of out-of-door sports and of practical agriculture. Two volumes of his private correspondence were published by his son in 1858. His biography has been written by George Ticknor Curtis (two vols., New York, 1869). His works, including his speeches, were published at Boston in 1851.

**WEBSTER, JOHN**, the Elizabethan dramatist, wrote for the stage as early as 1601, but the date of his birth, like most of his biography, is unknown. His death occurred about 1654. According to his own account he was "one born free of the Merchant Taylors' Company." He seems to have begun his dramatic career as a conjuditor of Dekker and others. The chief of the plays of which he was the sole author are—"The White Devil, or Vittoria Corramboni," "The Duchess of Malfi," and "Appius and Virginia," printed in 1612, 1619, and 1654 respectively,

dates which do not mark the periods of their production on the stage. These are tragedies. The plays which he wrote in alliance with others are of various kinds. "Westward Ho!" and "Northward Ho!" for instance, in which he co-operated with Dekker, are bustling pictures of the English life and manners of his time. As to his general position Webster ought to be ranked next below Ford. With less of poetic grace than Shirley, he had incomparably more vigour; with less of nature and simplicity than Heywood, he had a more elevated genius and a bolder pencil. But the deep sorrows and terrors of tragedy were peculiarly his province, and he stands almost unrivalled in depicting the horrible. Webster's works, with some account of the author, and notes, were edited by Mr. Dyce in 1830. In 1857 also appeared Hazlitt's edition of Webster's works.

**WEBSTER, NOAH**, an American lexicographer, was born at West Hartford, Connecticut, in 1758. He entered Yale College in 1774, served under his father, a captain in the militia, during the campaign of 1777, and graduated in 1778. In 1783 he published the first part of his "Grammatical Institute," which was followed in the course of the next two years by the second and third parts. The first part formed the basis of his famous "Spelling-book," which became the standard spelling-book of the United States, and of which, in its various editions and revisions, more than 70,000,000 copies have been issued. His copyright income of one cent per copy served to support him during his long labours on his great "American Dictionary of the English Language." He early found himself seriously embarrassed by want of knowledge of the origin of words, and with praiseworthy industry and thoroughness he laid aside his work and spent ten years in acquiring the knowledge and material necessary for his undertaking. He then commenced his task anew, and after seven years' labour, part of which period was spent in France and England, he brought it to completion in 1828, when the dictionary was published in two vols., 4to. Numerous editions have since appeared. He died at Newhaven, 28th May, 1843.

Webster's industry was great, and some of its results were valuable. He added many words and corrected many errors, while he did much in the way of improving definitions. The main fault of his work is to be found in his fondness for a fanciful etymology.

**WEDGE** (Old Eng. *Wecg*), in mechanics, is a prism of wood or metal whose base is a triangle; it is employed to remove two objects from one another laterally, or to rend asunder the parts of a body; an edge which is parallel to the geometrical axis of the prism being introduced between the objects or parts of the body, and the whole wedge being then driven forward by a percussive force, as the stroke of a hammer.

Let  $ABC$  represent the section of a wedge perpendicularly to the mathematical axis; and

for simplicity suppose this section to be an isosceles triangle. The plane passing through  $A$  and  $B$ , perpendicular to  $ABC$  and to the paper, is called the head or back of the wedge; the planes passing through  $A$  and  $C$  and  $B$  and  $C$  perpendicular to the paper are called the sides; and their line of section, passing through  $C$ , is called the edge.

The motive power, supposed to be represented by some weight, is applied to the head of the wedge, and may be supposed to act in the direction  $MC$  perpendicularly to

that plane, and passing through  $C$  in the edge. Let the material which is to be rent asunder be in contact with the sides of the wedge in lines passing through  $a$  and  $b$  perpendicularly to the paper; and let the two parts yield as if they were capable of turning about some point  $c$  in the direction of  $MC$ , produced if necessary: then it is evident that the effect of the wedge will be the same as if a section of the latter, perpendicularly to the axis, were  $abc$ . Imagine  $ad$ ,  $bd$  to be drawn perpendicularly to  $ac$  and  $bc$ , then those lines will meet at a certain point, as  $d$ , in the line  $MC$ : imagine also the parallelogram of forces,  $adbd$ , to be constructed; then  $dv$  or  $2dN$  will represent the motive force, and  $da$  or  $db$  the pressure which that force exerts at  $a$  or  $b$  perpendicularly to  $ac$  and  $bc$ . Let  $r$  represent the motive force, and  $R$  the pressure at  $a$  or  $b$ ; then, in equilibrium, the latter will represent the reaction of the material in the direction  $ad$  or  $bd$ , and we have

$$r : R :: 2dN : da.$$

But the triangle  $AND$  is similar to  $ENA$ : therefore

$$dN : da :: aN : ac,$$

and consequently  $r : R :: 2aN (-ab) : ac$ .

If  $c$  were supposed to coincide with  $e$ , we should have

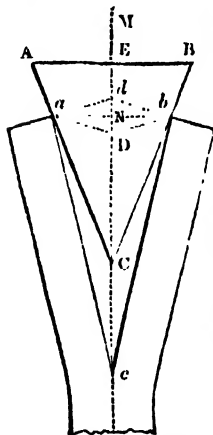
$$r : R :: 2aN : ac,$$

or by similar triangles  $abc$ ,  $ABc$ .

$$r : R :: AB : AC.$$

The best and simplest illustrations of the single wedge are axes, nails, plugs, planes, chisels, needles, and all sharp-edged and sharp-pointed instruments.

**WEDGWOOD, JOSIAH**, the first improver of English pottery, and the creator of a new and important branch of English commerce, was born on the 12th of July, 1730, at Burslem, where his father earned a scanty living by working at the potter's wheel. The latter died when Josiah was eleven years old, and the boy at that early age was compelled to gain his bread by working as a thrower to his elder brother. At that time the manufacture of earthenware in England was in a very rudimentary condition, and British households were supplied with the commoner sort of ware from Delft in Holland, while China furnished the costly porcelain. Staffordshire produced earthenware only of the coarsest quality, which was hawked about the country by the workmen themselves, or by the common pedlars. A malignant attack of small-pox, which finally settled in his left leg and necessitated its amputation, compelled young Wedgwood to relinquish the potter's wheel. He formed a partnership with a workman as poor as himself, named Harrison, and began business at Stoke. His taste for decoration and a higher style of manufacture appears not to have suited the commercial notions of this partner nor of a succeeding one, named Whieldon, in conjunction with whom he had made and dealt in earthenware knife-handles, green pickle leaves, and fanciful articles of that kind. At length he returned to Burslem, and setting up on his own account in a small thatched house, by assiduous labour and close observation, animated by an ardent desire for improvement, he gradually made his way to prosperity. In a few years his discoveries effected such a revolution in the manufacture of pottery as to lead to the export instead of the import of the finer earthenwares. In 1763 he obtained a patent for a cream-coloured porcelain which he called Queen's Ware, and his subsequent experiments resulted in the addition of nine additional species of ware to the English manufacture. By these discoveries a new branch of industry was planted in his native county, and thousands of hands were employed and well paid where a few years previously a comparatively small number made only a poor livelihood as potters. Increasing in business, Wedgwood established a house in





London, where Mr. Bentley became his partner. Every effort was made to add elegance of design to the other merits of his ware. He found out the boy, John Flaxman, then helping his father to make plaster casts in their shop in New Street, Covent Garden. "Well, my lad," said Wedgwood, "I have heard that you are a good draughtsman and clever designer. I'm a manufacturer of pots. I want you to design some models for me—nothing fantastic, but simple, tasteful, and correct in drawing. I'll pay you well. They are for pots of all kinds—tea-pots, jugs, tea-cups, and saucers. Especially I want designs for a table-service. Begin with that. What you design is meant for the eyes of royalty. Think of that." The connection thus formed between the manufacturer and the artist was profitable and honourable to both. Wedgwood's single-hearted loyalty was sufficiently rewarded by the appointment of royal potter being conferred on him by Queen Charlotte. He was extremely successful in his imitations of ancient works of art—specimens from Herculaneum, lent to him by Sir W. Hamilton; the celebrated Barberini or Portland vase, lent by the Duchess of Portland; and many rare samples of porcelain. He was also a zealous improver of the county he lived in, made a turnpike-road 10 miles long through the Potteries, and vigorously seconded Brindley in the construction of the Trent and Mersey Canal. In 1771 he built a mansion and works near Newcastle-under-Lyne, round which he formed a village for his workmen, calling it Etruria. Here he died on the 3rd of January, 1795. His life was written in two vols., by Eliza Meteyard (London, 1865), on an elaborate and comprehensive scale; and a more popular but less complete biography by Llewellyn Jewitt was also published in 1865. See also "Wedgwood and his Works" (London, 1872); "A Handbook of Wedgwood Ware" (London, 1875); a paper in the Right Hon. W. E. Gladstone's "Gleanings" (London, 1879); and the articles under CERAMIC ART and PORCELAIN.

**WEDMORE**, a parish of Somerset, England, is situated on the Mendip Hills, 8 miles W.N.W. of Wells. The population is 8060. It is celebrated for the peace made in 879 between Alfred the Great and Guthorm the Dane, with the consent of the Witan of all England, one of the earliest treaties we have with the consent of Parliament expressly asked and given. It gave more than half England to the Danes. Guthorm received baptism at Wedmore, and was christened Ethelstan, and swore on his new faith to keep the treaty, and indeed very fairly did hold to his word till his death in 890. The division between Englishman and Dane ran along the Thames to the mouth of the Lea, then by Bedford and the Ouse to Watling Street. Thus Guthorm had all Northumbria and East Anglia, Alfred all Wessex and the south of Mercia, with a shadowy hold on Wales.

In regarding Alfred as king of England careless readers are but too apt to overlook the peace of Wedmore and its confession of weakness. A glance at the map will show that the Dane had by far the larger share.

**WEDNESBURY**, a market-town of England, in the county and 18 miles S.S.E. of Stafford, 123 miles from London by rail, is situated on the slope of a hill. The town is modern, but is irregularly laid out. The parish church, which occupies the summit of the hill, is tolerably spacious, and has a western tower. There are several other churches and chapels, some of them handsome structures, numerous schools, a town-hall, free library, and public baths. The town is situated in the heart of the South Staffordshire coal and iron district, and has considerable manufactures of machinery, grates, edge-tools, files, nails, screws, &c. Enamel painting is also extensively carried on, and there is a soap manufactory. A valuable potter's earth is obtained in the vicinity. Wednesbury was created a parliamentary borough by the Reform Act of 1867. Its parlia-

mentary limits were reduced in 1885 by the creation of the borough of West Bromwich. It returns one member. The population of the parliamentary borough in 1881 was 68,142; of the town and parish, 24,566.

**WEEK** (Old English, *woice*; Middle English, *weke*). This well-known period of seven days, now universally adopted over the Christian and Mohammedan world, is the most obvious and convenient division of the lunar month; it is a period directly derived from the number of celestial bodies known to the ancients as *moving* among the fixed stars, an origin perpetuated (as we shall see) in the names of the week-days; and it is also, more nearly than any other short term would be, an aliquot part of the solar year of 365 days.

Dion Cassius attributes the invention of the week to the Egyptians, from whom he seems to say it was borrowed in later times by the Greeks and other nations. It was unknown to the Greeks of the classical ages, and also to the Romans, till it was gradually adopted along with Christianity after the reign of Theodosius.

The curious passage we have referred to in Dion Cassius is the source of all that is known as to the origin of the names that have been given to the seven days. The Ptolemaic arrangement of the heavenly bodies according to their distances from the earth is in this order:—Saturn, Jupiter, Mars, the Sun, Venus, Mercury, the Moon (Saturn being the most distant); and it was a principle of the ancient astrology that these planets presided in this succession over the hours of the day. Upon this notion, if the first hour be assigned to Saturn, it will be found that the 25th (or first hour of the second day) will fall to the Sun; the 49th (or first of the third day) to the Moon; the 73rd (or first of the fourth day) to Mars; the 97th (or first of the fifth day) to Mercury; the 121st (or first of the sixth day) to Jupiter; and the 145th (or first of the seventh day) to Venus. *Dies Saturni* (the day of Saturn), *Dies Solis* (the day of the Sun), &c., are accordingly the Latin designations that have been given to the days of the week; and from these have been formed the modern names used in different countries, either by literal translation (in the Italian, Spanish, French, and other languages of the Latin stock), or, in the Teutonic tongues, by the substitution, in some cases, of the corresponding deity of northern paganism for the classical god. A curious anomaly occurs in the Italian *Sabbato*, Saturday, so called from the Jewish Sabbath, while their Sunday is the "Lord's Day," *Domenico*, the French *Dimanche*. The German name for Saturday is "Sunday-even," *Sonnabend* as well as *Samstag*, a corruption of *Sambatsdag*, i.e. Sabbath-day, or in the French form, *Samedi*. Thus the deity of the Old Saxons most resembling Mars being held to be Tiu, the day of Mars was called by them, after their conversion to Christianity, *Tiuas Daeg*, whence our Tuesday. For a similar reason the day of Mercury received the name of *Wodnes Daeg* (that is, *Wotan's* or *Odin's Day*), whence our Wednesday; the day of Jupiter, *Thunres Daeg* or *Thor's Day*, whence our Thursday; and the day of Venus, *Frige Daeg* or *Friga's Day*, whence our Friday.

It is a remarkable fact, that the week of seven days is not only a recognized space of time in the ancient Brahmanical astronomy, but that the days (beginning with *Souravaram*, the day of Venus, or our Friday) are named in succession after the same planets or heavenly bodies as among the Greeks and Latins. In still earlier times the ancient Chaldeans, and also the Egyptians, kept the week, named after the same seven heavenly bodies (or rather after the gods associated with them), and rested on the seventh day, because in Egyptian superstition that was an unlucky day (as Friday is with the superstitious among ourselves), and work done on it would surely prove evil. The Jews probably did not observe the Sabbath until the Exodus, when they continued the Egyptian custom they



had learnt, but altered its meaning. For see Job, which contains no allusion to it: see also the remarkable passage in Deuteronomy (v. 15), "Remember that thou wast a servant in the land of Egypt, . . . therefore the Lord thy God commanded thee to keep the Sabbath day." It seems to have been only among the Jews that a religious signification was given to the seventh or concluding day. They had also three other periods denominated weeks:—(1) The week of weeks (see Deut. xvi. 9, 10). (2) The week of years; that is, seven years, during the last of which the land remained untilled, and the people enjoyed a sabbath. (3) The week of seven sabbatical, or forty-nine years, which was succeeded by the jubilee (Lev. xxv.) The *Feast of Weeks*, otherwise called the *Feast of Pentecost*, *Feast of Harvest*, &c., was celebrated seven weeks, or forty-nine days, after the Passover, in commemoration of the giving of the law on Mount Sinai fifty days after the departure from Egypt. The French Revolutionaries of 1793 tried to abolish the week in favour of the decade, but the system established in 1793 had already proved quite unworkable and hopelessly cumbrous by 1805, and was then abandoned.

**WEEKES, THOMAS**, one of the best of the great English madrigal writers of the Elizabethan period, when England for a brief time was the leading musical nation. The date of his birth and death are not known with certainty, but the publication of his works extends from 1597 to 1611. He was fond of writing compositions in five and six parts, "apt for viols and voyces," that is, playable by four viols as an instrumental piece, or singable as a madrigal. The title pages of his collections of 1598 and 1660 describe him as "of the coledge at Winchester Organist," but in his "ayeres or phantasticke spirits for three voyces" of 1608 he is "gentleman of his Maiesties chapel, batchelor of musike and organist of the cathedrall church at Chichester." He took his bachelor's degree at Oxford in 1609. We have ninety-four madrigals and anthems by Weekes, mostly a little stiff and antiquated, but of sterling worth. His greatest composition is "As Vesta was from Latmos Hill Descending," one of the magnificent "Oriana" set with which all our best composers honoured the great Elizabeth in 1601. This remarkable madrigal has a close in augmentation which has never been excelled, and is as greatly esteemed now as on the day it was written.

**WEENIX, JAN BAPTIST** (1621-65), was an excellent painter of the great age of the Dutch school. He is equally admirable in historic pictures, landscapes, and sea pieces.

**JAN WEENIX**, his son (1640-1719), often called Weenix the Younger, caught the style of his father and carried it to greater perfection. He chose, however, a different class of subjects—live or dead game; hares, pheasants, ducks, birds of all sorts, of the finest form and colour, frequently as a heap of dead game guarded by a dog, or with the weapons of the chase lying beside them. His "Dead Game and a Dog," in the National Gallery, is a delightful piece, often admired by sportsmen for its brilliancy and truth, as well as by artists for its colour and grouping. His best work is the "Pheasant" at the Hague.

**WEeping Willow.** See **WILLOW**.

**WEEVER** (Trachinidae) is a family of fishes belonging to the order ACANTHOPTERYGII. The Trachinidae are small carnivorous fishes found in nearly all seas, living on the bottom near the coast. The species of the typical genus *Trachinus* are common on the coasts of Europe, extending to South Africa, and are also found on the coast of Chili. They have an elongated compressed body, covered with very small cycloid scales. There are two dorsal fins, the first of which is short, with six or seven spines, and the second is long and soft; the anal fin is long; the ventral fins are placed under the throat (jugular), and consist of

one spine and five rays. The operculum is armed with a long spine directed backwards. There are small conical teeth in the jaws and on the vomer and palatine bones. The head is greatly compressed, and the eyes are lateral, but directed upwards. Two species are common on British coasts. The Greater Weaver, Sting-Bull, or Sea Cat (*Trachinus draco*) usually measures about 12 inches long, though specimens have been taken which had attained a length of 18 inches. It is of a yellowish-brown colour. Painful wounds are inflicted by the spines of the dorsal fin and operculum, causing great local irritation, and sometimes violent inflammation. The severity of the wound is due, according to Günther, to the poisonous properties of the mucous secretion in the vicinity of the spines, which are deeply grooved. In France and Spain the fishermen are required, under a penalty, to cut off the spines before the fish is sent to market. The weever is very tenacious of life, living for some time after its removal from the water. It frequents the bottom of the sea, and often lies half buried in the sand, watching for its prey, which consists of shrimps, the fry of fishes, sand launces, gobies, and other small fishes. It is taken with the trawl-net or on deep sea lines. The flesh is wholesome and esteemed for the table. The Lesser Weaver, Viper, or Sting-fish (*Trachinus vipera*) is more common on British coasts than the preceding species, to which it bears a close resemblance. Its usual length is about 5 inches, but it sometimes measures as much as 10 inches. Its habits are similar to those of the greater weever, and it is capable of inflicting similar wounds with its spines. Both species are found on the coasts of western Europe and in the Mediterranean, and the greater weever extends along the African coast to the Cape of Good Hope. The *Stav-gazer* (*Uranoscopus*) also belongs to this family.

**WEEVIL** (Curculionidae) is a family of beetles belonging to the group RHYNCHOPHORA, distinguished by the head being prolonged into a rostrum or snout, which bears at its extremity the mouth organs, and from which the antennae spring. The antennae are club-shaped, and are usually geniculate, the basal joint being long, and the remaining joints set at an angle to it. The weevils form a very numerous and widely distributed family, being abundant both in temperate and tropical countries. Over 12,000 species have been described, and the total number of species is estimated by Jekel at not less than 30,000. They are favourites with the entomologist on account of the singularity and often beauty of their forms and colours. The splendid diamond beetle, the wing-cases of which furnish such gorgeous microscopic objects, is a member of the tribe. Many of them are adorned with the most vivid metallic lustre, and some in intensity and brightness of hue emulate gems.

The weevils are interesting in another point of view. Many of them in the larval state are dangerous enemies to the agriculturist, destroying grain, fruit, flowers, leaves, stems, and roots, and from their numbers often perpetrating serious mischief. The larvæ are soft white cylindrical grubs, curved towards the tail, without feet, with hard heads and horny jaws. Most of them undergo their metamorphoses within the portion of the plant in which the egg is laid, and construct a kind of cocoon. The perfect insect is generally found on the same plant as its larvæ, but is not, as a rule, injurious. The **CORN-WEEVIL** (*Calandra granaria*) is very destructive in granaries, and an allied species, *Calandra oryzae*, is equally injurious in India and other tropical countries in storehouses of rice and grain. The **Palm-weevil** (*Rhynchophorus palmarum*) belongs to a genus which contains some of the largest known beetles. It is found in tropical America, and is an inch and a half in length. The larva is large and fat, between 2 and 3 inches long, and lives within the stems of palm-trees. It is esteemed as a delicacy by the natives. The

larva of an allied species, *Rhynchophorus sacchari*, commits great ravages on the crops of sugar-cane in the West Indies and Guiana; it is also eaten. Species of the genus *Rhynchites*, seventeen of which are British, attack various kinds of fruit trees, the eggs being laid generally in the young fruit. Species of the genus *Apion* attack clover, vetches, and other leguminous plants. Pines and other conifers are subject to the ravages of species of *Hyllobius*. The Nut-weevil (*Balaninus nucum*) lays its eggs in young hazel-nuts. The species of the genus *Otiorynchus* are very destructive in gardens, the larvæ of some feeding on the roots of plants in pots, while those of others feed on the young shoots and buds of wall-fruit and hothouse plants. The larvæ of species of *Orchestes* burrow in the leaves of various plants.

**WEIGHT.** The weight of a body, that is, of a given bulk of known substance, is referred to that of water by what is called the SPECIFIC GRAVITY of the substance. It is said, for example, that the specific gravity of ivory is 1826 when that of water is 1000. This means that any bulk of ivory is more weighty than the same bulk of water in the proportion of 1826 to 1000. When the specific gravity of water is called 1, that of ivory is 1·826.

As a general rule, however, in speaking of weight we refer not to the specific but the absolute weight. It is agreed that a certain mass of iron shall be called a pound, and we balance masses of unknown weight of the same or any other substance against the pound, its multiples or its fractions, until we find the weight precisely equal. It is to be remembered, when weight is to be very accurately taken, that every body is buoyed up to a certain extent by the air; and the weight of a body in air is less than it would be in a vacuum by the weight of its own bulk of air. Now the air varies in weight, as may be ascertained by the indications of the barometer, in a manner depending upon the superincumbent pressure, the temperature, and the quantity of moisture contained in it. A hundred cubic inches of dry air, when the barometer is at 30 inches and Fahrenheit's thermometer at 60°, weigh 31·012 grains. In measuring standards of weight, therefore, close attention must be paid to the state of the air at the time of weighing, and to the substance weighed. If an iron weight balance a wooden one in a given state of the atmosphere, for that very reason there cannot be strict equilibrium in any other state of the atmosphere. Wood being at least seven times as bulky as iron, the effect produced on the weight of the wood by the alteration of the state of the air is at least seven times as much as that produced on the iron.

In consequence of these and other necessary precautions, balances for scientific purposes of extreme delicacy are exceedingly difficult to manufacture, and almost as difficult to work with when made. In the Standard Weights and Measures Department of the Board of Trade, in Palace Yard, Westminster, they have one balance—it need hardly be said, inclosed with scrupulous care in a glass case—by which they can weigh any object to the hundredth part of a milligramme, a milligramme being 0·01543 part of a grain. This, perhaps, does not convey any very tangible idea. It will be more intelligible, though less scientific, to say that if we take a hair and manage to cut off from the end of it a bit that would require a microscope to see it, that scrap will be sufficient to turn the scale. Of course this goes quite beyond the bounds of practical utility, but it is the pride of this office that the accuracy of their instruments shall be unrivalled, or, at any rate, unsurpassed. In weighing any object by this marvellous balance the relative volumes of the air displaced by the weight and the thing weighed are made the subject of careful calculation. To avoid the necessity for this another beautiful little balance has been devised in which the weighing takes place in an absolute vacuum; the scale, the weight, and

the thing weighed being all under perfect control from the outside of the thick glass case in which the whole apparatus is inclosed. It is wonderfully ingenious, but for practical purposes it is found to be better to do the weighing in the air and make the necessary corrections for the difference of atmospheric displacement. All the balances in use in this office are illuminated by the electric light, for which they have a galvanic installation. As a precaution against the slight heat of the light, which might affect the process of weighing, the tiny lamp is fitted up in a globe of water; and lest the personal proximity of the operator should, by the warmth of his body or of his breath, similarly affect the proceeding, he stands some distance off and reads the indicator by the use of a telescope.

When the Houses of Parliament were burnt down in 1831, it is well known that the standard yard measure was destroyed, and the yard had to be re-invented. This unit of all our measurements, and the unit of all our weights—the pound—are now kept together in a ponderous iron safe, specially constructed for them, and sacredly guarded, in a vault at the bottom of the old Jewel Tower, in the Tower of London. The imperial pound weight is inclosed in a small iron chest of its own inside the large one, and is never exposed to the profane gaze. See the article STANDARD MEASURE.

**WEIGHT OF THE EARTH.** See EARTH, CAVENDISH EXPERIMENT, SCHERHALLER, &c.

**WEIGHTS AND MEASURES.** It is impossible to over-estimate the importance of having a recognized system of weights and measures, based on certain correct and readily accessible standards of magnitude, weight, and value. Without these mercantile transactions and scientific and other statistics would get into a state of unintelligible confusion, and give rise to endless mistakes and ceaseless quarrels. The excessive inconvenience arising from the adoption of various systems in one country has been amply illustrated in Great Britain by the existence of one bushel in Winchester and another in York; one acre in England, another in Scotland, and a third in Ireland; troy weights, avoirdupois weights, and apothecaries' weights—all these making a most vexatious complication of what ought to be very easily understood.

The best method of obviating this inconvenience is the construction of standards of reference, the same to be preserved in the custody of some public authority, so as to be easy of access when questions arise. And, in case of loss or deterioration, to insure the permanence of a standard, carefully constructed copies should be made of an authorized one; if these were distributed among the larger towns of the kingdom, manufacturers of weights and measures would thereby be deprived of any excuse for errors in their workmanship.

Simple as this may appear, it is nevertheless a work requiring the exercise of the greatest skill and scientific nicety. It would not much matter if a draper's yard measure varied the 1000th of an inch from the recognized standard; but if two standard measures differed as much one from the other, it would be a source of constant trouble to those engaged in accurate mathematical work. Very minute details have to be considered in the construction of standard weights or measures. Especial regard must be had to the material used, which should be that least liable to decay; but against the most suitable in this respect, as glass or platinum, there are the decided objections of brittleness in the one case, and extreme softness in the other. The material must also be that best calculated to resist the changes of temperature, climate, &c.

Their preservation is also a matter of the utmost importance, and this, too, is attended with some difficulty. If a standard measure be made of the exact length, however durable the material, the ends will get worn by handling and repeated contact, and it is thereby to an appreciable

extent rendered untrue. This is avoided by making the bar, instead of just the yard measure, a little longer, and marking the yard upon it. In the case of the standard of weight, accurate preservation is next to impossible. A slow, though sure waste, is caused on every occasion it is used, and by the oxidation of the metal; so that all that can be done is to retard this deterioration to the greatest extent possible. See the articles *STANDARD MEASURE* and *WEIGHT*.

The 41 & 42 Vict. c. 49, which came into operation on 1st January, 1879, was passed to consolidate the law relating to weights and measures. It enacts that the same measures and weights shall be used throughout the United Kingdom, and that all contracts, bargains, sales, or dealings shall be conducted by the imperial weights and measures. Any person who sells other than by these weights and measures is liable to a fine of 40s. for every such sale. Any person who prints, in a newspaper or otherwise, a return, price list, or price current, in which the weights quoted or referred to denote a greater or less weight or measure than is denoted or implied by the same denomination of the imperial weights and measures is liable to a fine not exceeding 10s. for every copy of such return. The Act also contains severe penalties for the use of false weights and measures, and provisions for stamping and verifying weights and measures.

Seeing the great advantage arising from uniformity of weights and measures in one country, the thought naturally occurs that it would be a still greater boon, especially for the purpose of trade and commerce, to have a system which, as far as practicable, should be universal. It is easily seen that no particularly national system can ever become of world-wide uniformity. There is no special reason why the Turkish almud or pike should give place to the English gallon or yard, any more than *vice versa*. Each standard answers the local purposes of its country very well, and either nation would have the same prejudices against yielding to the other; so that it is useless ever to hope for a cosmopolitan uniformity unless some method of weighing and measuring can be devised which should not be the peculiar notion of any particular country, but whose adoption would require the mutual abnegation, to some extent, of every system peculiar to a certain locality, and which would commend itself to all by its absence of nationality. The nearest approach to such a desideratum is found in the metric system; and to lead the way for its general adoption, the French have given up their ancient weights and measures and made it their national standard. The question of substituting it for our present method has been several times before the House of Commons, and recommendations to that effect have frequently been made by parliamentary committees.

The word "metric" is derived from the French *mètre*, the name of the linear measure, which is the basis of the system, including money, weights, and measures, both solid and liquid. The *mètre* is a ten-millionth part of a quadrant, or a quarter of a meridian of the earth, the length having been estimated from actual measurements taken between Dunkirk and Barcelona. These measurements are now known to be seriously faulty, so that after all the *mètre* is based upon an arbitrary measurement. Still, provided the standard is truly kept, this is really not of vital consequence. The *mètre* is, by a curious coincidence, remarkably near the length of the seconds pendulum, with which our yard is connected, the length of the pendulum being about 39½ English inches, and of the *mètre* about 39½, or 99·371 inches. The metrical system, with its equivalents in the English method, will be found fully explained in the article *DECIMAL SYSTEM*, and its advantages are such as to make every one wish for its adoption at no distant day. It has, indeed, been legalized, so that any one may use it who chooses; but what is

wanted is for government to adopt it in the levying of customs and other duties, and thus pave the way for its becoming general. To the commercial man and public companies it would prove immensely advantageous, not only for its simplicity, but for the actual economy it would effect in bookkeeping. It would sweep away every form of reduction and compound arithmetic, and the use, in ordinary cases, of any fractions but decimals, which can be worked quite as readily as whole numbers; so that every mercantile transaction, from the simplest to the most important, would be conducted by the use of the common elementary rules, of which every child ten years old ought to be the master. Moreover, it would not exclude the use of the ordinary divisions of halves, quarters, eighths, and even sixteenths, which enter so much into every-day use, because all these can be very readily expressed in decimals, and more easily treated in that form than as common fractions. The fifth and final report of the Standards Commission, issued in 1871, speaking of the metric system, pointed out that whereas the present practice required the maintenance of 115 standards, all the standards of weight, capacity, and length on the metric system are comprised in forty-five.

We now proceed to describe the English weights and measures at present used:—

**Troy Weight.**—The troy pound is 5760 grains. Gold and silver are measured by this weight, as are also precious stones; but, as may be supposed, the measure of these is the grain. The diamond is valued by carats of 15½ to the ounce troy; so that the carat is very nearly 3½ grains (3·17). At one time the ounce troy was divided into 24 carats of 4 grains each for gold and silver, and into 150 carats of 4 grains each for diamonds; so the pound troy contained 7200 diamond-carat grains. But now the CARAT has only the sense noted under that word for gold and silver, and is altered as above for diamonds.

**Apothecaries' Weight.**—In dispensing medicines, the pound troy used to be divided into 12 ounces (℥), the ounce into 8 drachms (ʒ), the drachm into 3 scruples (ʒ), consequently each scruple is 20 grains. But in recent years the apothecaries' weight troy has fallen much into disuse; and all weights named in the London Pharmacopœia are based on the ounce avoirdupois of 437½ grains, and the pound avoirdupois of 7000 grains.

**Apothecaries' Fluid Measure.**—Sixty minims (℥) make a fluid drachm (ʒ), 8 fluid drachms a fluid ounce (℥), 20 fluid ounces a pint (℥). The minim of water is as nearly as possible the natural drop; but not of other substances, the drops of which vary with their several tenacities. In the imperial system a pint of pure water weighs precisely a pound and a quarter.

**Avoirdupois Weight.**—The pound is 16 ounces, and the ounce 16 drachms or 437·5 grains; the modern pound is 7000 grains (the same as the troy grains). The hundred-weight is 112 pounds, and the ton 20 hundredweights. The stone is 14 pounds (but the stone of butcher's meat is 8 pounds). The ton of shipping is not a weight, but a measure—40 cubic feet, holding 24 hundredweights of sea-water.

**Long Measure.**—Three barleycorns make an inch, 12 inches a foot, 3 feet a yard, 5½ yards a pole or perch, 40 poles a furlong, 8 furlongs (1760 yards) a mile. Also 24 inches are a nail, three-quarters of a yard a Flemish ell, 5 quarters an English ell, 6 quarters a French ell. A pace is 2 steps, or 5 feet; a cubit is 18 inches, a fathom is 6 feet, a cable's length 120 fathoms. The chain is 22 yards, or 100 links; 10 chains make a furlong, and 80 chains a mile. A league is 3 miles. A knot (admiralty) is 6082·66 (say 6082½) feet; 60 knots make a degree = 69½ statute miles. The barleycorn is now disused, and the inch is sometimes divided into 12 lines (as in France), but oftener into tenths or eighths. The point (a term

rarely used) is the sixth of a line, the seventy-second of an inch. The hand, used in measuring the height of horses, is fixed at 4 inches by 27 Henry VIII. cap. 6. The palm (not often used) is 3 inches.

**Square Measure.**—A square perch is  $30\frac{1}{2}$  square yards; 40 square perches are a rood; 4 roods an acre. The acre is also 10 square chains, or 4840 square yards. Rood is the same as rod.

**The cubic measures**, or measures of capacity, do not immediately depend upon the cubic foot, except in the case of timber. Forty cubic feet of rough timber, or fifty feet of hewn timber, make a load. 128 cubic feet a cord, a rod of brickwork = 306 cubic feet—about 4500 bricks and 75 cubic feet of mortar.

The preceding were untouched by the Act which introduced the imperial measures. The old measures of capacity, the wine, ale, and beer, and the dry measure, are now replaced by the imperial.

**Imperial Measure.**—This has superseded the old corn, wine, and beer measures. The gallon contains 277.274 cubic inches, and is 10 lbs. avoirdupois of water. Four gills are a pint, 2 pints a quart, 4 quarts a gallon, 2 gallons a peck, 4 pecks a bushel, 8 bushels a quarter, 5 quarters a load. The barrel is 36 gallons, the kilderkin is half the barrel, the firkin a quarter of the barrel. A hogshead is 54 gallons, and a puncheon 72. Of these the gill and load are not named in the statute, but are derived from common usage. The Act leaves the higher measures of wine, &c., to custom, considering them apparently as merely names of casks, which in fact they are, and leaving them to be gauged in gallons.

**Wool Measure.**—Seven lbs. make a clove, 2 cloves a stone, 2 stones a tod (the tod therefore equals the quarter of a cwt.),  $6\frac{1}{2}$  tods a wey, 2 weys a sack, 12 sacks a last.

**The old Scotch standard foot** was 12.0194 English inches, and the mile was 1976 $\frac{1}{2}$  yards, 216 $\frac{1}{2}$  more than the English mile. The Scotch liquid gallon was 823.6272 English cubic inches. Four gills made a mutchkin, 2 mutchkins a chopin, 2 chopins a pint, and 8 pints a gallon. The Irish malt gallon was 272 $\frac{1}{2}$  cubic inches, and the liquid gallon 217.6 cubic inches. The Irish pole was 7 yards, which made the mile equal to 480 yards more than an English mile (ratio 11:11), and the acre greater than the English acre in the proportion of 196 to 121. The chief foreign weights and measures are given under their respective headings as separate articles.

**United States.**—British weights and measures are usually employed, but the old Winchester gallon and bushel are used, instead of the new or imperial standards. They are—wine gallon, .83333 gallon; ale gallon, 1.01695 gallon; and bushel, .9692 bushel. Instead of the British cwt. a quintal of 100 lbs. is used.

**Ancient Weights and Measures.**—The Romans divided the *as* or *libra*, or any other unit, into twelve *unciae*, so that the *uncia* became little more than a name for the twelfth part. The *libra* of weight was thus subdivided—3 *siliqua*, 1 *obolus*; 2 *oboli*, 1 *scrupulum*; 4 *scrupula*, 1 *sextula*; 6 *scrupula*, 1 *scitellus*; 8 *scrupula*, 1 *duella*; 3 *duellæ*, 1 *uncia*; 12 *unciae*, 1 *libra*. The Roman *libra*, or pound-weight, is about .71 of the English avoirdupois lb.

In the measures of length the *pes* or foot was divided not only into 12 *unciae*, but also into 16 *digiti*. And 4 *digiti* were 1 *palmus*; 4 *palmi*, 1 *pes*; 1 $\frac{1}{2}$  *pes*, 1 *cubitus*; 2 $\frac{1}{2}$  *pedes*, 1 *gradus*; 2 *gradus*, or 5 *pedes*, 1 *passus*; 1000 *passus*, 1 *milliare* or mile. The Roman foot was 11.62 English inches.

The *jugerum* was an area of which the *scrupulum* (or 256th part) was the square decempeda, or 100 square feet.

The *arpennia* (whence *arpent*) was a Gallic measure, which Columella defines as semi-jugerum, but whether of Romans or Gauls is not clear.

The *amphora*, or *quadranta*, for liquid measure, was a

cubic foot, and contained about 5.6586 imperial gallons; the *congius* was the eighth part of the *amphora*.

The *modus* or *modium*, of dry measure, was 16 *sextarii*, or the third part of the *amphora* or cubic foot.

Of the Greek weights and measures the Greek foot was longer than the Roman by the twenty-fourth part of the latter; the *parasang* (originally a Persian word) was 30 *stadia*; the *plethron* was 100 feet, and in square measure it was a square whose side was 100 feet in length, or 10,000 square feet; the *metretick*, in liquid measure, is said to have been an *amphora* and a half; and in dry measures the *medimnos* was two *amphoræ*.

**WEIMAR**, from its high literary fame sometimes called the "Athens of Germany," the capital of Saxe-Weimar-Eisenach, is situated on the left bank of the Ilm, 55 miles by railway south-west from Leipzig, and in 1480 had 19,944 inhabitants. It stands in a pleasant valley, with a wooded mountain to the north, and low hills to the south and east. The river, over which there are two bridges, winds along the south side of the city. Weimar is an open town with irregular streets; there are, however, many agreeable houses, but its general appearance is plain and rather antique. The palace of the grand-duke is beautifully situated, and the interior is fitted up with great elegance and taste. In some of the apartments are frescos, illustrating the works of Goethe, Schiller, Herder, and Wieland, all of whom formerly resided in Weimar. The adjoining park is the favourite promenade of the inhabitants, and would be an ornament to any great city. The court theatre was built in 1825, and was for some time under the management of Goethe and Schiller. It was then one of the most celebrated in Germany, and its opera is still very well conducted, the citizens being great lovers of music. The grand-ducal library, which is open to the public, contains above 170,000 volumes, besides manuscripts, medals, coins, copper-plates, and drawings. The principal church deserves notice, as containing the sepulchres of the reigning family, and of the great soldier, Bernhard of Weimar, and of Herder, the philosopher and critic. The house of Goethe in the *Frauenplatz*, and that of Schiller on the esplanade, are shown to the public. A monument has been erected to the memory of the latter. Weimar has a much-frequented gymnasium, a seminary for schoolmasters, an academy for drawing, painting, and sculpture, a house of correction, and an orphan asylum. Falk's establishment for destitute children was converted, in 1829, into a public school, by the name of Falk's Institution. There are some manufactures, but they are of small importance, the population deriving their chief support from the presence of the court and visitors. The principal articles of commerce are—woollen cloth, linen, leather, cards, gloves, paper, books, maps, &c. Kotzebue was born at Weimar.

**WELD** (*Reseda luteola*), also called *Yellow Weed* and *Dyer's Weed*, is a plant belonging to the order *REN-DA-CEÆ*, and to the same genus as the *mignonette*. It is common in Britain in waste places, especially on calcareous soils, and is also found in many parts of Europe. It grows to a height of from 1 to 3 feet, and has numerous lanceolate glossy leaves and terminal spikes of small greenish-yellow flowers. It yields a beautiful yellow dye, and was formerly largely cultivated in this country and on the Continent for dyeing purposes, but has been more or less superseded at the present day by other dye substances.

**WELDON, JOHN** (1676-1736), whose fine cathedral anthems still afford us so much elevated pleasure, was born at Chichester. He was a pupil of the great Purcell, which accounts for the smoothness, purity, and expressiveness of his writing, quite in the style of his immortal master. He was organist of New College, Oxford, in 1694, and became a gentleman of the Chapel Royal in 1701, succeeding Dr. Blow as organist there in 1708. His anthems, "In thee,

O Lord," and "Hear my crying," are among the treasures of our church music.

**WELFS.** See GULFES.

**WEL'LESLEY PROVINCE**, a British settlement occupying a narrow strip of the Malayan coast, 45 miles in length and 8 in width, situated on the east side of the Strait of Malacca, opposite to Penang or Prince of Wales Island, 2 miles distant, of which it is a dependency. The total area is 270 square miles. The climate is healthy, and well-made roads extend from end to end. Almost the entire area is under cultivation, whether in sugar, rice, tapioca, coffee, or cocoa-nuts. It seems almost beyond belief that at the beginning of the century this wealthy and prosperous province was part mangrove swamp, part impenetrable jungle. The population in 1881 was 97,324.

**WEL'LESLEY, RICHARD COLLEY** (MARQUIS WELLESLEY), an English statesman, and one of the greatest of the governors of India, the eldest child of Garrett, first earl of Mornington, was born in Grafton Street, Dublin, 20th June, 1760. At an early age he was sent to Eton, where, and at the University of Oxford, he stood high for classical attainments. On the death of his father in 1781, he took his seat in the Irish House of Lords, and continued a member of that body till the Union. He was then returned a member of the British House of Commons by the borough of Beer-Alston. In a few years he made such progress in the favour of the king and the confidence of the government, that he was nominated to succeed Lord Cornwallis in the government of British India. He was raised at the same time to the British peerage by the title of Baron Mornington. He reached the Gauges in May, 1798, and in 1799 was created Marquis Wellesley in the peerage of Ireland.

His governor-generalship was an eventful period. After the defeat and death of Tipu Sahib [see TIPU SULTAN], his efforts were directed to the extension of the commercial intercourse of India, and to the commencement of those important financial reforms which eventually raised the revenue of the company from seven to upwards of fifteen millions annually. In 1801 he was involved in warlike operations. In that year he despatched a force up the Red Sea to assist in wresting Egypt from the power of France. He next turned the British arms against the Marhattas, conquered the whole country between the Jumna and the Ganges, and compelled Sindia and the Rajah of Berar to make peace. His brother, Sir Arthur Wellesley's, victory of Assaye, and the crowning battle of Lassawaree, terminated the war. His victories, and the success attending his policy in relation to the native states, determined the supremacy of the British in India, and the political map of India remained almost as he left it for the next forty years. In 1805 he resigned his office, and on his return was well received by the government and the East India Company; but complaints were raised that he had been guilty of oppression towards the native powers, especially the Nabob of Oude, and articles of impeachment were presented against him (without effect) in the House of Commons.

In 1808 he rendered ministers efficient service by his vindication of the expedition to Copenhagen. He was soon afterwards appointed ambassador to Spain. On the death of the Duke of Portland he was recalled, and accepted the appointment of secretary of state for foreign affairs under Mr. Perceval. After the latter's assassination, in May, 1812, Lord Wellesley undertook to form a coalition government, but he soon found that the undertaking was hopeless, and resigned his charge. On 1st July, when Lord Liverpool had announced himself as head of the ministry, Lord Wellesley brought forward in the House of Peers a motion favourable to Roman Catholic claims, similar to that which Mr. Caning had carried a few days earlier in the House of Commons. It was lost by only one vote, and that

vote a proxy. He continued for ten years to offer a modified opposition to government. In December, 1821, he accepted the appointment of lord-lieutenant of Ireland, which he continued to hold till March, 1828. His arrival was the signal for an outburst of the fiercest party spirit. The Orangemen of Dublin insulted him in the theatre; the southern counties became the scene of insurrectionary movements, and it was found necessary to have recourse to an Insurrection Act and other coercive measures.

In 1831 he was appointed lord-steward under Earl Grey. In September, 1833, he resigned that office, and was once more appointed lord-lieutenant of Ireland. On Sir Robert Peel's brief accession to office (1834-35) the marquis retired. He accepted the office of lord-chamberlain on the formation of the second Melbourne ministry, in April, 1835, but resigned it in the course of the same year. He died at Kingston House, Brompton, 26th September, 1812.

**WEL'LINGBOROUGH**, a town of England, in the county and 10 miles E.N.E. of Northampton, and 63 miles from London. Its chief buildings are several churches, a town-hall, and a corn exchange. Iron mining is an extending industry, but shoemaking chiefly employs the inhabitants. The population in 1881 was 13,794. Wellingborough derived its name from the wells or mineral springs around it, which formerly enjoyed such celebrity that, in 1626, Charles I. and his queen resided here in tents for a considerable period that they might drink the waters pure from their source.

**WEL' LINGTON**, a market-town of England, in the county of Salop, 11 miles east from Shrewsbury, and 152½ from London by the Great Western Railway. It is a growing place, with several handsome churches and chapels and a fine town-hall. The chief industries are the manufacture of nails, agricultural implements, and iron-ware. There are numerous coal and iron mines and limestone quarries in the vicinity. The town was the first rendezvous of the king in the Civil War in 1642. Two miles south is the WREKIN, with its extensive view. The town is near the ancient Watling Street; and in the immediate neighbourhood are chalybeate and sulphurous springs. Population of the town, 6217; of the parish, 11,199.

**WEL' LINGTON**, a market-town of England, in the county of Somerset, 170 miles from London by the Great Western Railway, is situated on high ground about 1½ mile south from the Tone, and consists chiefly of two spacious streets. A market-house was erected in 1832, and a town-hall in 1847. The church is a fine Gothic building, with a handsome embattled western tower, 100 feet high, crowned with twelve pinnacles. The altar-piece is considered one of the finest in England. There are many dissenting chapels. The Duke of Wellington derives his title from this town, and is lord of the manor. A pillar, 120 feet high, in commemoration of the battle of Waterloo, is erected on the lofty summit of the Blackdown Hills. Wellington has a manufacture of woollen stuffs and earthenwares. The population of the town in 1881 was 6360.

**WEL' LINGTON**, the capital of New Zealand, and seat of government, and the chief town of the above province, situated on the shores of Port Nicholson, an inlet of Cook's Strait. It is 180 miles by sea from New Plymouth, 150 miles from Nelson, about 1200 miles south-east of Sydney, and 1400 miles north-east of Melbourne. With both these cities there is steamer communication. It was the first and principal settlement of the New Zealand Company; its convenient harbour, a noble sheet of water 6 miles in length by 6 in width, and central position, giving it many advantages. Owing to the prevalence of earthquake shocks in the locality, the city chiefly consists of wooden buildings, though a long immunity has now led to a greater use of bricks. The principal buildings are the government house, the houses of legislature, the govern-

ment buildings (an enormous building of wood covering nearly 2 acres), supreme court building, opened in 1881, the cathedral, and other churches and chapels. The botanical gardens are much frequented. Large water-works for the supply of the city have been constructed. The population of the town in 1881 was 20,563. Wellington succeeded Auckland as the capital of New Zealand in 1874.

**WELLINGTON, ARTHUR WELLESLEY, DUKE OF, K.G.**, field-marshal, one of the greatest generals that not only England but Europe has ever produced, was the third son of Garrett, first earl of Mornington, and brother of the illustrious statesman and Indian governor-general, the Marquis Wellesley. He was born at Dangan Castle, County of Meath, 1st May, 1769—that is, in the same year as Chateaubriand and Humboldt, Soult and Napoleon. After a short curriculum at Eton, he was removed to the military college at Angers, where he distinguished himself by the correctness of his conduct. Before he was eighteen he was appointed to an ensigncy in the 73rd regiment of foot, and in a few months removed to a lieutenancy in the 76th. His connections being influential, his promotion was rapid, and so early as 1793 we find him a lieutenant-colonel in the 33rd foot. He had scarcely attained his majority when parliamentary honours were added to his military successes. He was returned to the Irish House of Commons as member for Trim.

As colonel of the 33rd, he embarked in 1794 to join the Duke of York's army in the Netherlands, and was employed in covering the retreat from Antwerp to the coast—a duty which he discharged with energy and prudence. In February, 1797, he landed with his regiment at Calcutta, and in the following year he was despatched by his brother, the governor-general, to reinforce the army of the Carnatic, under General Harris. He was consequently engaged in all the operations that led to the reduction of the Mysore; at the battle of Malavelly, 27th March, where his skilful movements largely contributed to the victory; and at the capture of Seringapatam, 4th May. He was afterwards appointed to a separate command, and in 1800 took the field against a noted Marhatta freebooter, Dhondiah Waugh, who was defeated and slain. Sindia, another and more powerful Marhatta chief, assuming a hostile attitude against the British government, Wellesley was despatched to chastise him. The campaign opened with the siege and capture of Ahmednugur. Crossing the Godavary, the British general came up with the Marhatta force, nearly 50,000 strong and supplied with ninety guns, on the plain of Assaye; and though he had only 3500 foot and 2000 cavalry, of whom not a third were British, he immediately attacked them, 23rd September, 1803, and won a complete victory, the enemy leaving 1200 dead upon the field and all his cannon. Fortress after fortress then submitted to the conqueror, and Sindia himself humbly sued for a truce. Scarcely had it been granted, however, before the treacherous Marhatta united with the Rajah of Berar, and both chiefs concentrated their forces on the plains of Argaum. By a rapid forced march the British commander overtook them, delivered a formidable attack, and scattered them to the winds, 29th November.

His great defeat, and the capture of Gawil Ghur, a rocky fortress which the natives believed to be impregnable, compelled both Sindia and his ally to humble themselves before British power, and peace was concluded on very favourable terms, the India Company gaining a large accession of territory. Wellesley's extraordinary services were rewarded with a K.C.B. and the thanks of both Houses of Parliament.

In 1805 he returned to England, and in November of the same year commanded a brigade in Lord Cathcart's Hanoverian expedition. In 1806 he married the Honour-

able Miss Pakenham. Shortly afterwards he was employed in the mixed political and military movements which checked Napoleon's designs upon Denmark, and terminated in the occupation of Copenhagen, in 1807. His services were again acknowledged by a vote of thanks in both Houses of Parliament. In 1806 he had been elected M.P. for Rye; he now sat for Minshall, on his appointment in April, 1807, as chief secretary for Ireland, and in 1808 was returned for Newport, in the Isle of Wight. To the discharge of his official duties he brought that straightforwardness of purpose, clearness of thought, and capacity for business which were peculiarly his characteristics. But the cast of his intellect fitted him to excel in the field rather than in the council, and his appointment to the command of a British force designed to assist in the expulsion of the French from the Spanish Peninsula opened up to him a career worthy of his surpassing military genius.

At the head of 10,000 troops, chiefly raw recruits, Wellesley landed at the mouth of the Mondego River in August, 1808; entered Leyria on the 10th, and having been joined by a small reinforcement of Portuguese, pushed forward against the French invading army, under Junot. On the 17th he defeated their advanced guard, 5000 strong, at Rolica; and on the 21st their main body, commanded by Junot in person, at Vimiera. The French loss on this occasion amounted to 3000 killed and wounded and thirteen pieces of cannon. As Wellesley was preparing to reap the fruits of his victory he was superseded by General Sir Henry Burrard, who in his turn gave place to General Sir Hew Dalrymple; and this officer, a man of courage but of little capacity, nervously incompetent to any great responsibility, concluded with Junot the Convention of Cintra, by which the French were permitted to evacuate Portugal with all their plunder, public and private. This shameful treaty awoke a storm of indignation in England. Wellesley returned home to undergo an examination before a committee of inquiry appointed by Parliament, and was honourably acquitted, but a severe vote of censure was passed upon the unfortunate Sir Hew Dalrymple.

On the death of Sir John Moore, Wellesley was appointed to the chief command of the Peninsular army, and immediately entered upon a series of well-planned operations, which are described in all their details in his "Despatches and Letters," and eventually carried the British arms in triumph across the Pyrenees. Even at this early period his sagacity had detected the internal weakness of the splendid fabric of Napoleon's power, and he looked forward with confidence to the time when Europe would be relieved from its oppressor. He never bated one jot of heart or hope throughout his arduous Peninsular campaigns, though hampered by the misgivings and incompetence of his superiors at home, by the insufficiency of the means most grudgingly placed at his disposal, by the scarcely concealed hostility of his Spanish colleagues, and too often by the clamour of faction and the violence of party spirit in England. With a devotion to duty which almost amounted to enthusiasm, he calmly advanced in the path he had laid down for himself, and year after year wrested the most brilliant victories from the finest troops and best generals of France, proving himself second to none among modern conquerors in coolness of judgment, promptitude of decision, and fertility of resource.

Wellesley arrived at Lisbon on the 22nd of April, 1809, and immediately moved upon Oporto, then occupied in force by one of Napoleon's ablest lieutenants, the illustrious Soult. He had with him about 16,000 troops. Soult had destroyed all the bridges and seized all the boats, but the British general contrived to secure three large barges, and on the night of 12th May carried his army across the Douro, which at this point is broad, swift, and deep, and drove the French out of Oporto with heavy loss. This



operation is justly considered one of the most brilliant passages in modern military history.

The British next advanced upon Madrid, to effect a junction with the Spanish army. At Talavera he was met by the French, commanded by Marshal Victor and General Sebastiani, and strongly posted. They mustered 43,000 foot, 7000 cavalry, and eighty guns. The allies, under Wellesley, were 51,000 strong, but 34,000 were Spanish, and being led by incompetent officers, worse than useless. When the French made their attack on the 27th of July the Spanish, after one discharge of musketry, took to their heels and fled. The British, however, opposed so stern a resistance that no ground was lost, and after a day's hard fighting both armies retained their respective positions. On the following day the battle was renewed, but owing to Wellesley's masterly manœuvres and the courage of his troops, it brought no good fortune to the enemy, who retired under cover of the night, with a loss of 944 killed, 6291 wounded, 156 prisoners, and seventeen guns. The total loss of the allies was 800 killed, 3913 wounded, and 652 missing. The victory, however, was rendered fruitless by the incapacity of the Spanish government and the feebleness of its officers. With his half-starved troops Lord Wellington (he had been elevated to the peerage for his services at Talavera) could attempt no forward movement, and he could secure no effective assistance from the Spanish forces. The junction of Soult, Ney, and Mortier menaced him with an attack in the rear from their powerful army, and he was constrained to fall back towards Ciudad Rodrigo.

Early in 1810 Marshal Massena assumed the command of the French army in Portugal—a splendid force of 65,000 men, well officered, well equipped, and excellently supplied. He commenced the campaign by investing Ciudad Rodrigo, which Wellington was too weak to relieve. His formidable advance then constrained the British general to fall back upon Busaco, where he planted himself on a rocky ridge, and awaited the approach of his enemy. Massena, on the 27th September, made two vehement attacks, but in each was repulsed with great slaughter. A loss of 4500 men taught him that the heights of Busaco were inaccessible. Wellington then leisurely retired to the famous lines of Torres Vedras, which he had been quietly engaged in constructing for some months, and where, with the sea for his base and a series of fortifications in his front, armed with 232 pieces of cannon, and extending 22 miles, he was literally impregnable. Massena arrived before the lines on the 7th of October. Their amazing strength discomfited him, and after a few sanguinary skirmishes he abandoned all hope of carrying them by assault. Nevertheless he continued watching them throughout the cold and dreary winter, until he had wholly exhausted all the surrounding country, and was reduced to a state of famine, while the English were supplied by sea with abundant stores. On the 6th of March, 1811, he abandoned Santarém, and commenced a retreat whose horrors can hardly be paralleled in the annals of war, although it was conducted with a masterly skill which military critics have freely recognized. He was sorely harassed by Wellington, who followed close in his rear, and inflicted upon him some loss at Redinha (11th March), Casal Nova (12th March), Foz d'Aronce (13th March), and at Sabugal (3rd April).

On the 5th of April the French re-crossed the Spanish frontier, thus terminating the third invasion of Portugal in disaster and shame. Wellington immediately invested Almeida, which Massena, now largely reinforced, resolved to save. He therefore re-entered Portugal on the 2nd of May, with 40,000 foot, 5000 horse, and thirty guns, and attacked Wellington in his position at Fuentes d'Onoro (5th May). The battle was gallantly contested, but terminated in the retreat of the French, who had upwards of 3000 men put *hors-de-combat*. Almeida was compelled

to surrender, and Badajoz was then invested. The junction of the forces of Marshal Soult with those of Marmont, who had succeeded Massena in his command, compelled the British, however, to raise the siege and retire upon Campo Major. The French had 70,000, and Wellington only 56,000, but they had learnt by this time to respect the genius of the British general and the solid courage of his troops. They did not venture an attack, but separating their forces, Marmont withdrew in the direction of Salamanca.

Wellington then laid siege to the formidable fortress of Ciudad Rodrigo, which he carried by assault on the night of the 19th of January, 1812, making the garrison prisoners. For this achievement he was raised to an earldom. He next invested Badajoz, and though it was bravely defended, successfully stormed it on the 6th of April. The carnage on both sides was terrible; the Allies alone lost nearly 5000 men. In June, Wellington directed his operations against Salamanca, forcing Marmont back upon the Douro, and after a succession of the most skilful manœuvres, which showed he was no less a master of tactics than of strategy, he defeated the French in the pitched battle of Salamanca, 22nd July, thus winning one of his completest victories. "I never saw an army," said Wellington, "receive such a beating!" Forty thousand men were put to the rout in forty minutes, with the loss of eleven guns, two eagles, stores, ammunition, 12,000 killed and wounded, and 7000 prisoners. The loss of the Allies did not exceed 700 killed and 4000 wounded. Marmont lost an arm, and four French generals were slain.

The victor was rewarded with the order of the Golden Fleece, and advanced to a marquise in the British peerage, while a sum of £100,000 was voted for the purchase of an estate to be settled on him, his heirs, and his successors. He visited Madrid, and afterwards Cadiz and Lisbon, being everywhere received with an enthusiastic welcome. An unsuccessful attempt to capture Burgos closed the campaign of 1812.

In the following May he again advanced into Spain, and at Vittoria, on the 21st of June, gained another splendid victory over the French, who were commanded by King Joseph Bonaparte in person, assisted by Marshal Jourdan. The enemy lost 151 pieces of cannon, all their ammunition, their treasure, their stores, their papers, 1000 prisoners, and 9000 killed and wounded. The French army was completely demoralized, and this one great battle virtually delivered Spain from their oppression. Well had Wellington won the field marshal's baton which was now presented to him. His long-meditated plan of operations had been successfully carried out. He had recaptured almost all the important fortresses of Spain, and gradually forced back the invaders towards the frontiers of their own country. He now continued his advance with amazing celerity, the French rapidly retiring before him, and by a series of successes obtained command of the Pyrenean passes. Napoleon made a great effort to arrest his progress, reorganized, re-equipped, and reinforced his army, and placed at its head his ablest marshal, Soult, duke of Dalmatia. Wellington meanwhile blockaded Pamplona and invested San Sebastian. An attempt to carry the latter by assault (25th July) unfortunately failed, owing to the immense strength of the defences; but on the 28th and 30th Soult was totally defeated at Sanroren, in the Pyrenees, and having lost 15,000 killed and wounded, and 4000 prisoners, swiftly retreated into France.

The siege of San Sebastian was then resumed, and the town stormed on the 9th of September. Pamplona also surrendered, and no strong fortresses being left in his rear, Wellington was free to undertake the invasion of France. In October he crossed the Bidassoa. On the 10th of November he defeated Soult on the Nivelle, capturing 1400 prisoners; again defeated him at Bayonne, and forced the



passage of the Nive (10th to 18th December), and on the 27th of February, 1814, a third time defeated the French marshal (at Orthes), and crossed the Adour. The minor engagements at Aire and Tarbes were followed by the successful passage of the Garonne; and on the 10th of April he consummated his unsurpassed series of triumphs by repulsing Soult under the very walls of Toulouse.

The allied Russian, Austrian, and Prussian armies having now entered Paris, and forced Napoleon to sign his abdication, the war was at an end. Wellington proceeded to Paris, where the allied sovereigns received him with the most marked respect. On the 2nd of May he was created Marquis of Douro and Duke of Wellington in the British peerage, and an additional grant of £100,000 was voted to him. For the twelfth time he received the thanks of both Houses of Parliament, and on his arrival in England the people seemed utterly unable to give due expression to their enthusiastic admiration.

He now took his seat for the first time in the House of Lords. In July he was appointed ambassador-extraordinary to the court of France, and immediately afterwards appeared at the Congress of Vienna as the representative of his sovereign. While the congress was still in session, intelligence arrived of Napoleon's escape from Elba and re-appearance in Paris, of the flight of Louis XVIII., and the re-establishment of the empire. The allied powers immediately denounced Napoleon as an outlaw, and declared war against him. The command of the British forces on the Continent was intrusted to their beloved general, who hastened to Brussels, and prepared to defend Belgium against the advance of the French. The operations which followed, and which gloriously terminated in the victory of the 18th of June, are described in our article WARTELOO. The Allies after this signal triumph marched upon Paris, virtually unopposed, and Louis XVIII. was restored. Wellington was then appointed to the command of the army of occupation, and resided in Paris from 1815 to 1818. He incurred some obloquy by refusing to exert his influence on behalf of Marshal Ney, who, in defiance of the terms of pacification, was brought to trial for high treason, found guilty, and shot. Two attempts were made upon his life, but both happily failed.

Honours and rewards were now lavished on the great general. The king of the Netherlands created him Prince of Waterloo. Foreign orders were showered upon him; statues were raised to his honour in the British metropolis; £200,000 was voted by Parliament for the purchase of the estate of Stratfieldsaye, in Hampshire, and he was appointed master-general of the Ordnance. On the coronation of George IV., in 1821, he officiated as Lord High Constable of England. In the following year he attended the Congress of Vienna as the British plenipotentiary. In 1826 he repaired to St. Petersburg on a special embassy, and prevailed on the Emperor Nicholas to act with England in mediating between Turkey and Greece. On his return he received the lucrative post of Constable of the Tower, and in 1827 was appointed commander-in-chief of the British army.

A man of such rank could not fail to play an important part in the political arena; but though his career as a statesman exhibited in the strongest light his integrity, his sense of duty, and his moral courage, he had been too long bred in camps to acquire a perfect rapport with the feelings and sentiments of the great masses of his countrymen, and his ministerial services did not add to his reputation. His political opinions were those of a rigid Tory, yet, on coming into power as prime minister in 1828, he was forced to accede to the popular demands and introduce liberal measures whose expediency he had strongly condemned. He repealed the Test and Corporation Acts, under pressure; and to avert, as he said, a civil war in Ireland, carried the Catholic Emancipation Act. His conduct with

respect to the latter measure excited much ill feeling among his supporters, and led to a ridiculous and bloodless duel between the "hero of a hundred fights" and the Earl of Winchelsea, 21st March, 1829. It is worthy of note that, at a later period, he issued, as commander-in-chief, a stringent order against duelling in the army; whence we may conclude that he had learnt to appreciate the absurdity of that method of satisfying "wounded honour."

In 1830 the administration of which he was the head resigned, on account of the growing excitement upon the question of parliamentary reform, and for a time he was exposed to the greatest unpopularity. The windows of his London residence, Apsley House, were broken by the mob, and in the streets he was received with abuse and volleys of stones. The crown, however, showed its confidence in his integrity by appointing him lord warden of the Cinque Ports, and the people soon repented of their temporary ingratitude towards their "Iron Duke." In January, 1834, he was elected chancellor of the University of Oxford. In the same year he was summoned from his temporary retirement by William IV. to assist in carrying on the government of the country, and accepted the post of foreign secretary in Sir Robert Peel's administration.

In April, 1835, he quietly retired from official life, except with regard to his position as commander-in-chief (to which he was reappointed in 1842); but his influence in Parliament and the country yearly increased, and in all difficult conjunctures his counsel was solicited and adopted. Honoured by his sovereign, beloved by the nation, his closing years, in their calm serenity, afforded a remarkable contrast to the stir and tumult of his early career. But he himself was unchanged and unchangeable—still the resolute, sagacious, self-reliant, self-controlling man, who flinched not at Assaye, and never despaired at Waterloo; never animated by any mean ambition, lust of power, or desire of aggrandizement; always inspired by an invincible love of order and rigid obedience to what he believed to be the dictates of duty; always prompt, active, and decided; attached to social intercourse, simple to a Spartan severity in his habits, manly in every thought, English in every feeling, correct in discernment, accurate in judgment, fertile in resource, and vigorous in execution. Well may the poet bid an admiring posterity remember the great soldier—

"Who never sold the truth to serve the hour,  
Nor palter'd with Eternal God for pow'r;  
Who let the turbid streams of rumour flow  
Thro' either babbling world of high and low;  
Whose life was work, whose language tale  
With rugged maxims hewn from life:  
'Truth-teller' was our England's Alfred named;  
Truth-teller was our English duke;  
Whatever record leap to light,  
He never shall be shamed."

Our resumé of his later years will necessarily be brief. In 1845 he had expressed himself doubtful of the policy of repealing the corn laws, but when convinced that the change was desired by the great body of the people, and that its delay would seriously embarrass the queen's government, he wisely withdrew his opposition, and co-operated with Sir Robert Peel in carrying through Parliament that most important legislative reform. In 1848 he aroused the supine indifference of his countrymen on the subject of the national defences by his famous letter to Sir John Burgoyne; and, as commander-in-chief, directed the measures for the preservation of peace in the metropolis during the Chartist outbreak of the 10th April.

On 14th September, 1852, while residing at Walmer Castle, he was seized with an epileptic fit, and died the same afternoon. His remains were honoured with a public funeral, and after lying in state at Chelsea Hospital, were interred, on the 18th of November, in St. Paul's, by the side of his rival in glory and patriotic devotion, Lord Nelson.

The more important biographies of the great duke are those of Wright (four vols., London, 1839-41); Maxwell (three vols., London, 1839-41; sixth edition, 1862); Stoeckeler (two vols., 1852-53); Brialmont (three vols., Paris, 1856-57; English translation, with emendations and additions by Gleig, four vols., London, 1858-60; popular abridged edition, London, 1875); and Yonge (London, 1860). For a full store of information concerning his military operations see the "Despatches of the Duke of Wellington during his various Campaigns" (thirteen vols., London, 1834-39; 2nd series, twelve vols., 1844-65), edited by Colonel Gurwood; and the "Supplementary Despatches and Memoranda" (seven vols., 1858-78), edited by his son Arthur Richard, second duke of Wellington. For that portion of his career which forms part of European history the works of Thiers, Charras, Thibaudeau, Napier, and Alison must be consulted, together with the principal memoirs of the French marshals and their imperial master, Napoleon I.

#### WELLINGTONIA. See SEQUOIA.

**WELLS**, an ancient city and bishop's see united with Bath, and a municipal borough and market-town of England, in Somersetshire, 134 miles W.S.W. from London, and 20 miles south-west of Bath, is situated in a valley at the foot of the Mendip Hills, near the source of the river Axe. The founder of the first church at Wells is said to have been Ina, king of Wessex, in 704. In the reign of Edward the Elder, in the beginning of the tenth century, the town became the seat of a bishopric, and the see was annexed to that of Bath in the reign of William Rufus. The writ of *congé d'élire* for the election of the bishop is, however, still addressed to the dean and chapter of Wells. Among the most celebrated bishops of this diocese have been Wolsey, Land, and Ken. The cruciform cathedral, which is one of the finest structures of the kind in England, forms a prominent object as seen from all the great roads leading to the city. It is 437 feet in length, and the transept measures 135 feet. The tower, which is over the junction of the nave and transept, rises to an elevation of 178 feet, and two other massive towers, each 126 feet in height, crown the extremities of the west front. This façade is remarkable for its tracery and sculptured figures of apostles, bishops, kings, and popes. There are about 150 statues of the size of life, and above 300 others of smaller size; and although many of them are much mutilated, the effect is very striking. The present cathedral was begun in the early part of the reign of Henry III. The central tower was erected at the beginning, and the two western ones were added about the end, of the fourteenth century. The general character of the building is Early English, with portions in the two later styles—these being very beautifully accommodated in their forms to the older parts. The Lady Chapel is considered by many to be the most perfect specimen of ecclesiastical architecture existing in this country. The magnificent west front of the cathedral was very carefully restored, under the superintendence of Sir G. G. Scott, in 1871-74. The cathedral contains several ancient and other remarkable monuments, including the tomb of Ina, king of Wessex. Close by are the bishop's palace and chapel, the latter restored in 1848. The residence is a castellated pile, on a space of 7 acres, including the Great Hall—a ruin of the thirteenth century—and it is inclosed by a moat, which is fed from one of the numerous wells from which the town derives its name. The limits of the diocese are, generally, the boundaries of the county of Somerset.

The city also contains the parish church of St. Cuthbert, a large and handsome building in the later Pointed style—its lofty square embattled tower being one of the most beautiful of the kind in England; a church in the east of the town, dedicated to St. Thomas, which was opened in

1859, and is a fine structure, with a spire 130 feet high; and places of worship for the Independents, Methodists, and Baptists. The other chief buildings are the town-hall, the market-house, Bishop Law's theological or training college, founded in 1810; two banks, national schools, almshouses, and a county lunatic asylum.

Wells has an air of great respectability and neatness. The streets are wide and well paved, and kept clean by streams of water running down their sides from a public conduit in the market-place. An excellent supply of water for the town is also obtained from the Mendip Hills, about 2 miles distant.

The only manufacture is that of brushes, but the town has a good market for the agricultural produce of a very fertile neighbourhood; and about 2 miles distant are some paper mills. There is excellent railway accommodation by the Great Western, Somerset and Dorset, South-western, and Bristol and Exeter lines. Wells is the head of a county court, and the summer assizes are always held here. The courts of quarter sessions take place twice a year, being, like the assizes, held in this city alternately with Taunton.

The municipal borough is governed by four aldermen, one of whom is mayor, and twelve councillors. Until the passing of the English Reform Bill of 1867 the parliamentary borough returned two members; it was deprived of one by that measure, and of the other by the Scotch Reform Bill passed in 1868. The population in 1881 was 4634. The environs of Wells are exceedingly picturesque, and within a few miles are Glastonbury Abbey and Tor, Cheddar Cliffs, and Wookey Hole.

**WELLS**, a seaport and market-town of England, in the county of Norfolk, 28 miles north-west from Norwich, and 149 from London on the Great Eastern Railway, is situated on a slight elevation rising above the marshy flat which here lines the coast, and about half a mile from the sea, on a creek whose mouth forms the harbour, capable of receiving small vessels. The shifting sands render the harbour difficult of access, but considerable improvements have been made in it. The town consists of two principal and some smaller streets, and has some rope-yards, machine works, breweries, flour mills, and some ship-building. The trade of the port is considerable. Corn and malt are shipped; and coals, timber, deals, bark, and tar are imported. A productive oyster fishery is carried on. The population in 1881 was 2645.

#### WELSH LANGUAGE AND LITERATURE.

The Welsh language, which is now and has been spoken in the principality of Wales as far back as historical records extend, is one of the Celtic family of languages. These languages are six in number—the Irish, the Gaelic of the Highlands of Scotland, the Manx or language of the Isle of Man, the Welsh, the Cornish, formerly spoken in Cornwall, and the Armorican or Bas-Breton of the province of Lower Brittany in France. The first three are the more ancient, and form the Gaelic group, the second three form the Cymric group.

The name Welsh was first given to the people who speak it by their English conquerors, and the same term, or a similar one, seems to have been used in many of the Germanic, and even of the Slavonic, languages to denote the Italians, or other nations whose languages resembled the Italian. *Walschland* was the name for Italy in German of the middle ages, and is not yet entirely superseded in the language of the common people. The proper name for the Welsh people is *Cymry*. Welsh is the oldest spoken modern language in Europe, except the Irish Gaelic alone, and there are Welsh poems in existence the origin of which is referred to the sixth century of our era. What is remarkable in these poems is the fact that the language of that early period is, after a very slight degree of study, really intelligible to those acquainted with the Welsh of our own day. While admitting that Welsh, substantially

as we know it, was heard by Cæsar directly he left the Gaulish parts of Britain, and is the only living bond between us and that past of over nineteen centuries ago, we can yet refuse to agree with many ardent Cymry who believe (as the Rev. J. Harris, editor of the native journal *Seren Gomer*, boldly asserted on their behalf, in 1814) that "no one can disprove that Welsh was the language spoken by Adam and Eve in Paradise."

Welsh has great power, simplicity, and precision. It is very rich, especially in roots, and has a remarkable capacity to express an entire abstraction in a single word. Its alphabet consists of thirteen simple and seven double consonants, and seven vowels, with numerous diphthongs and triphthongs. The letter *c* has always the sound of *k*; *ch* is sounded gutturally, as in the Scottish word *loch*; *dd* is equivalent to the soft sound of *th* in the English word *that*; *f* has the sound of the English *r*; *ff* of the English *f*; *ll* a peculiar sound, similar to that of the French *l* mouillé; *u* and *y* that of the Italian *i* or English *ee*; and *o* of *oo* as in fool.

The grammar of the Welsh language is very intricate, owing to the number of the permutations it requires—e.g., the word for "father" is *tad*, "his father" is *ei ddad*, "her father" is *ei thad*, "my father" *fy nhad*. In the same way *p* is changed in inflexions into *b*, *mh*, and *ph*; *b* into *f* and *m*; *d* into *dd* and *n*. &c. There is one article, which is not declined, but varies according to the initial letter of the following word. There are but two genders, masculine and feminine. The verb has no present tense, to express which the future is used, or the substantive verb *rye* (I am) with the infinitive. There is, however, an imperfect, perfect, pluperfect, and a future tense, which are formed both in the optative and indicative moods by endings and changes of vowels without auxiliary verbs—e.g., *carien*, I loved; *cariu*, I have loved; *cariu'n*, I had loved; *caraf*, I shall love. The personal pronouns are—*mi*, I; *ti*, thou; *ef*, he; *hi*, she; *ni*, we; *chwi*, you; *hwy* or *hwynt*, they.

Unlike the dying Gaelic tongues, Welsh is keenly alive at this day. In fact, more people speak Welsh than did a century since, and the local patriotism is more fervid.

The best dictionary of the Welsh language is that of Owen Pughe (third edition, two vols. 8vo, London, 1861), and good Welsh grammars have been published by John Davies and the Rev. T. Rowland, of both of which several editions have appeared.

**Literature.**—The literature of Wales lays claim to a very early origin, and commences with poems ascribed to the sixth century. It is thus more ancient than that of any of the Teutonic or Slavonic family of languages. Till the commencement of the present century most of these ancient compositions remained buried in the libraries of colleges or of private individuals, but in 1801 there was published, at great expense, by Mr. Owen Jones, a furrier in London, a work entitled "The Myvyrian Archæology of Wales" (three vols. 8vo), which contains the chief productions of Welsh literature from about 500 to 1400. This work was named after Myvyr, Mr. Jones' native place, and it was chiefly edited by two eminent Welsh scholars, Edward Williams and Dr. Owen, afterwards Dr. Owen Pughe. Mr. Jones also made manuscript collections for a further continuation of this work, which, however, still remain unpublished.

The history of Welsh literature may be divided into four periods—(1) from the earliest times to the Norman Conquest in 1066; (2) from that period to the Reformation; (3) from the Reformation to the commencement of the reign of George III. in 1760; and (4) from 1760 to the present time.

1. The earliest Welsh author whose works are given in the "Myvyrian Archæology" is Aneurin (510 to 560), whose poem called "Gododin," detailing the adventures of the Octavius (a tribe of the Cymry) before their immigra-

tion from Cumberland to Wales, justly entitles him to precedence among the bards of his time. After Aneurin follow Taliesin, prince of bards, from 520–570; Llywarch Hen, or Llywarch the Old, perhaps the most poetical of the Welsh bards, from 550–610; and Myrddin Wyllt, or Merlin the Wild, celebrated in romance, from 530–600.

The earliest Welsh prose of unquestionable authenticity is the "Code of Laws" of King Hywel Dda, or Howel the Good, who died in 748, after a reign of forty years. These laws were first published in 1830, in Watton's *Leges Wallicæ*, and subsequently in 1811, by the Record Commission. The only other prose work of the period of note is a collection of proverbs, attributed to St. Cadog (sixth century), but it is of doubtful authenticity.

2. The second period is from 1066 to the time of the Reformation, and the incorporation of Wales with England, in the reign of Henry VIII., in 1536.

During this period there flourished many bards, and the "Myvyrian Archæology" contains the compositions of no less than fifty-nine of them, between the years 1120 and 1380. The fourteen poems allotted to Gwalchmai, the favourite bard of Richard Cœur de Lion, who accompanied him to the Holy Land, are of great fire and excellence. The compositions of Llywarch ab Llywellyn, a bard of a very superior order, and of Cynddelw Brydydd Mawr, or the Great Poet, who has enriched Welsh literature with nearly fifty meritorious productions, are well worthy of notice. By far the most popular poet of this period, however, is Dafydd ap Gwilym, often called the Cambrian Petrarch, from his being the author of no less than seven score and seven poems addressed to his lady love. The great resemblance between the style of the compositions of this poet with that of the Scottish Burns has been generally remarked. A volume of translations from his poems, by A. Jones, was published in London in 1831. Besides the poets mentioned above who flourished during this period were many others, but few of them of any note.

To this period may be assigned the Welsh *Triads*, or maxims in triplets, each setting forth a historical event or a moral principle, said to be of Druidic origin; and the *Mabinogion*, or collection of tales written to while away the time of young chieftains, and intended to be repeated at the fireside, now made accessible by Lady Charlotte Guest's fine edition of them, in Welsh and English (1838–49).

3. The third period, from 1536 to 1760, embraces two events which produced a great effect on the country—viz., the Reformation, and the incorporation of Wales with England by Act of King Henry VIII. in 1536. The first book printed in the Welsh language was an almanac, with a translation of the Lord's Prayer, the Ten Commandments, &c. (1546), by William Salesbury, a zealous Protestant. He also published the first dictionary, English and Welsh, in 1547. The first translation of the New Testament into Welsh was made by this eminent man, and published in London in 1567. The translation of the whole Bible was completed by Dr. William Morgan, vicar of Llanrhaidr, Denbighshire, in 1588, who for this labour was made bishop of St. Asaph's. A revised edition of this by the succeeding bishop, Dr. Parry, published in 1620, is the standard Welsh text in actual use. The eagerness with which the Welsh adopted the reformed doctrines was remarkable. To this day their descendants are distinguished by their earnest religious character and their love of simple church-usages.

4. The fourth period of Welsh literature extends from 1760 to the present time; and, since it is universally accessible, needs no detailed notice.

After the accession of George III. a great impetus was given to Welsh literature by the further development of the art of printing, the establishment of periodical papers, the institution of patriotic societies, and the spread of Methodism.

The periodical literature of Wales is of comparatively recent origin. A journal called *Yr Eurgrawn Cynreig*, the "Welsh Treasure," was first published in 1770. The *Seren Gomer*, or "Star of Gomer," was started in 1814, and still exists. The best literary periodical is *y Traethodydd*, "The Essayist," dating from 1845, and discussing the contemporary poetry and philosophy of Europe. The leading newspaper is the *Abercrafu*, "Times."

**WELSH MUSIC.** The body of Welsh national music is a very remarkable one, both for its richness and its curiously modern tone. The first impression on hearing one of the finest Welsh airs is that it cannot be genuine, for it sounds as if it were written yesterday. In this Welsh music differs both from the older Irish, Scottish, and English melodies; and the reason is not far to seek, for while these countries had only rude and imperfect instruments, the Welsh possessed their three-stringed harp, which gave them the command of the chromatic scale with the sharps and flats of our music of to-day, a luxury scarcely dreamt of outside the principality till much later times. [See HARP.] The Welsh probably got their harp from Ireland, judging by the shape of the oldest examples; but they at once greatly enlarged it, and by changing the thin metal strings into thicker gut strings, they gained the delicious true harp-tone, which is the charm of the instrument. Their reverence for the national instrument was prodigious. To "sing upon the harp" (for they never called it playing) was the privilege of free-born men only; it was death to a slave to handle it. All gentlemen were bound to play it. We know from the Venerable Bede (seventh century) that it was passed from hand to hand at the feasts, for he mentions a case of an ignorant boor who slunk away to escape the coming harp and hide his disgrace. To any one who has ever tried to play upon a Welsh (triple-stringed) harp, the fact must be astonishing. A competent harpist was held in great honour—he paid no tax, and his person was sacred.

Among the most beautiful and best known Welsh tunes are "Rhyfelgyrch Gwyr Harlech" (March of the Men of Harlech), "Llwyn on" (The Ash Grove), altered and spoilt by Gay as "Cease your Funning" "Clychau Aberdyfi" (The Bells of Aberdovey), "Ar hyd y nos" (All through the Night), known by a doggerel song to the air with the words "Poor Mary Ann," and "Y Gadlys" (The Camp), which Duffey vulgarized as "Of noble race was Shekin"; and many more might be mentioned, possibly to the reader's surprise, for every one seems to have thought Welsh music a fair mark for plunder. Thus the theme of Handel's famous duet and chorus, "Happy we," in "Acis and Galatea," is simply "Codiad yr Haul" (The rising of the Sun), note for note, worked out in a most masterly manner.

The rules for Welsh music are of great antiquity, and exist in a revised form as settled by the bardic congress, called for the purpose by Gruffydd ap Cynan, prince of North Wales, in the eleventh century, which gives all the keys, scales, modes, and rhythms then recognized in the clearest way, and with astonishing precision. There is also extant in the seventeenth-century copy of these laws, now in the British Museum, a small body of music, traditionally descended from the ancient Britons, and certainly of very great antiquity, the notation being by letters of the alphabet, according to the following very clear scale:—

cc, dd, ee, ff: g | a | b | c | d | e | f:

g, a, b, c, d, e, f: g . a . b . c . d . e . f:

which renders these pieces quite legible to any ordinary reader. One piece is expressly stated to have been the "prelude to the salt"—i.e. the introduction to the banquet—used by the knights of King Arthur, in the sixth century.

Without insisting too strongly upon the authenticity of these pieces (though there is nothing known which should

absolutely contradict it), it remains certain that the Welsh have had several centuries more of experience in fine harmonies and chromatic scales than the rest of the United Kingdom, and therefore it is at once explained how it is that at this day the Welsh choirs are so excellent in their performances, and the love of the best music is so widely spread. The practice of penillion singing, too, has never been suffered to die out, and the difficulty of this exercise may be appreciated from a short description of it.

*Penillion singing* is one of the essential parts of an Eisteddfod, one of those annual bardic congresses and contests in which Welshmen so delight. The singer has to produce extemporaneous stanzas to the accompaniment of whatever well-known Welsh melody a harper may choose. This was the method of teaching of the ancient Druids, whose rules and answers to catechumens were always delivered by penillion (*Pen*, a head—i.e. head-work, as opposed to recitations by heart). Of course those who compete store their memories with many a *penill*, for the singers follow one another without pause, and whatever metre the first takes binds all his successors, while the subject is strictly adhered to at the same time, and any repetition disqualifies the candidate guilty of it from further contest. There are two chief kinds of penillion. In the first the singer follows the tune, and each line is taken up by a burden or chorus; in the second there is no chorus, and the singer has to enter in upon the tune after two or three bars, but must end exactly with the harper, and should vary the tune by a sort of free counterpoint, not follow it.

**WELSH POOL** (so called to distinguish it from Poole in Dorset), a market-town, parliamentary and municipal borough, about 9 miles north-west of Montgomery, and 182 from London. It is regarded as the capital of the county. The town stands near the left or west bank of the Severn, in a hollow opening upon the river, and is watered by two brooks which flow into the Severn. The houses are chiefly of brick, and built with regularity. The town-hall is in the centre of the principal street, and there is a library and museum. The Montgomery Canal passes close to the town, and the navigation of the Severn begins here. Welshpool has two churches and several chapels. It was formerly the centre of the flannel manufacture, and has some tanneries and malt-houses. The population of the parish in 1881 was 4988; of the parliamentary borough, 5211; of the municipal borough, 7107. The corporation consists of four aldermen and twelve councillors, including a mayor. The town of Welshpool was formerly called *Tralltime*, the "town by the lake," from a pool, whence it also derives its English name. In the immediate vicinity is Powis Castle. It is included in the Montgomery district of boroughs, which returns one member.

**WEN**, an encysted tumour, usually growing upon some part of the hairy scalp. It consists of a closed sac, of fibrous texture, more or less closely connected with the neighbouring parts, but generally capable of being enucleated entire by careful dissection. The contents of the sac consist of granular fat mixed with fluid oil globules, a great abundance of epithelium scales, and very often crystals of cholesterine. Wens are regarded as usually resulting from the accidental closure and subsequent hypertrophy and distension of one of the sebaceous follicles, the epithelium cells and semi-solid oleaginous or sebaceous materials gradually accumulating. In general it is unwise to interfere with them, and as a rule it is better for the patient to endure the unsightliness they cause than to run the risks of a surgical operation. Where from their size and the inconvenience they give rise to it becomes imperative to remove them, it is necessary to see that the patient is in good health, and that he avoids all excess after the operation. The removal of a wen is a comparatively simple surgical process, but there is always an amount of risk from erysipelas in operations on the scalp.

**WEN (P)**, a Runic letter used in early English writing to signify *w*, but gradually dying out after the Norman Conquest.

**WENDOVER, ROGER OF**, one of our valuable early chroniclers, was a native of Wendover in Buckinghamshire and a monk of St. Alban's, afterwards precentor of the abbey and prior of the dependency of Belvoir. He was deposed from his priory for extravagance in 1219, and recalled to St. Alban's, where he died in 1237. Under the name of "Flores Historiarum" (Flowers of History) he wrote a Latin history of the world from the creation down to the nineteenth year of Henry III. Of course the early part is useless, but when he writes of events happening in his own time (1185-1235) he is very valuable from his manly and impartial tone. Matthew Paris based his work on Roger's down to the date when the latter ceased.

**WENER, LAKE**, the largest lake in the Scandinavian Peninsula, and the largest in Europe, next to those of Ladoga and Onega, lies 150 miles south-west of Stockholm, and about 30 miles inland from the Cattegat. In length it measures 90 miles, in extreme breadth 50 miles; it is 153 feet above the sea-level, 309 feet in greatest depth, and has a superficial area of 2408 square miles. It receives numerous small rivers, and among others the Klar, and discharges its surplus waters into the Cattegat through the channel of the Göta. A canal connects it with Lake Wetter, and inland communication is thus established between the Cattegat and the Baltic. It abounds in fish. It is nearly divided into two portions by the peninsulas that stretch towards its centre, one from the northern, the other from the southern shore; and its banks exhibit a succession of pleasant landscapes.

**WENHAM**, a town of Massachusetts, in the United States of North America, 22 miles N.N.E. of Boston by railway, is celebrated on account of the excellence and great purity of the ice obtained at Wenham Lake, close by, from which, although it is only a mile square and 200 feet deep, about 200,000 tons are obtained every year, and exported to India and other countries.

**WENLOCK**, a municipal borough of England, in the county of Salop, embracing the four market-towns of Much Wenlock, Broseley, Trowbridge, and Madeley, is 12 miles south-east from Shrewsbury, and 153 from London by the Great Western Railway. Much Wenlock has several churches and dissenting places of worship, a corn exchange, and a fine old town-hall. The principal object of interest in its neighbourhood are the ruins of Wenlock Abbey, which are situated in a valley on the south side of the town. This Cluniac abbey was established in 1080 by Earl Warine, on the site of a nunnery founded in 680. The remains include parts of the church, 400 feet long, in the Norman and Early English style; the Norman chapter house, Lady chapel, cloisters, &c. Wenlock communicates with Shrewsbury by the Wenlock and Severn Valley railways. The population of the town is 2494. Much Wenlock is the centre of a large agricultural district. There are extensive limestone quarries in the vicinity, which are very valuable. The chief industries are brick and tile making, tobacco-pipe making, and coal mining. The municipal borough is divided into three wards, and is governed by six aldermen and eighteen councillors. The population in 1881 was 18,122.

**WENLOCK BEDS**, in geology, a series of thin limestones and calcareous shales, occurring in the upper division of the SILURIAN SYSTEM, and so called from their typical development in Wenlock Edge, Shropshire. They are largely quarried and used in the manufacture of mortar, cement, and for manuring purposes, both in Shropshire and in the neighbourhood of Dudley, South Staffordshire. The Wren's Nest and the Castle Hill, Dudley, are composed of these beds, whence they are often spoken of as the *Dudley*

*limestones*. They are generally crowded with marine fossils of every type known to characterize the latter part of the Silurian period.

**WENTLETRAP** (Scalania) is a genus of Molluscs belonging to the order GASTEROPODA, and family SCALARIDÆ. Over 100 species are known, chiefly inhabiting tropical seas, though some are found on the coasts of Britain, Norway, and Greenland. The shells, which are remarkable for the beauty of their form, are generally of a pure lustrous white. They are spiral and turreted, with many whorls, which are sometimes separate, and adorned with numerous elevated transverse ribs. The aperture is circular and entire. The operculum is horny, with few whorls. The animals exude a purple fluid when molested. The Royal Wentletrap (*Scalania pretiosa*), a native of the Chinese seas, has a shell of such beauty that in the hey-days of shell-collecting fine specimens used to fetch enormous sums. It is of a pale yellowish colour, with the whorls separate, and united by the white projecting ribs. It is now worth only from five to ten shillings.

**WENTWORTH, SIR THOMAS**, Earl of Strafford. See STRAFFORD.

**WERGILD** (*wer*, the modern German *wehr*, worth or value, here the value of a man's life in money), the fine payable to a man's relatives by one who had killed him. All the family shared in the money thus received. If the murderer, or homicide, could not or would not pay his wergild he was put out of the king's peace, and those whom he had injured might take whatever vengeance upon him they pleased. The wergild for a *eorl* was 200 shillings, for an *eorl* or a king's *thegn* it was 1200 shillings, as fixed by the laws of Cnut the Great, which were a compilation of earlier customs and laws.

**WERNER, ABRAHAM GOTTLÖB**, an eminent geologist, was born at Wehlav, in Upper Lusatia, on 25th September, 1750, and died at Dresden on the 30th June, 1817. He was educated in a school in Silesia, and afterwards in the School of Mines of Freiberg in Saxony. He afterwards studied at the University of Leipzig, and devoted special attention to mineralogy. In 1775 he was appointed professor of mineralogy in the School of Mines of Freiberg. The subject of geology became his special object of study, and in 1787 he issued a treatise on the classification of rocks. He adopted the view that the formation of the various rocks in the globe was due to chemical precipitation from water. He applied this to the primitive rocks as well as the others, and included basaltic and porphyritic rocks in the category. He lectured on the theory of formations, and showed that the crust of the earth consists of a series of strata lying over each other in a determinate order, and in a uniform system. In 1791 he published his view of the formation of geologic veins, and accounted for them on his theory of deposition from water. His statements excited great notice among geologists in all parts of the world, and procured him many followers. He kindled an extraordinary enthusiasm in his pupils by his eloquence. His "Neptunian" system was taught in many schools. [See NEPTUNIST.] The Wernerian system was ultimately strongly opposed by the "Plutonic" system of the followers of Hutton, and out of the controversies which arose truth has been evolved. The two theories require to be conjoined in order to account for the appearances seen in the rocks. Igneous action, as well as deposition from water, must be taken into account. Werner acquired great celebrity throughout Europe as a geologist and mineralogist, and he may be said to have been the founder of the system of mineralogy.

**WERNER, FRIEDRICH LUDWIG ZACHARIAS**, a German dramatic poet once very famous, was born on the 18th of November, 1768, at Königsberg, where his father occupied the chair of history and eloquence. In 1793, after much dissipation, he obtained an inferior situa-

tion at Warsaw, and began to take an active interest in freemasonry, in which he imagined he had found the principal means for the improvement of mankind. To what mystic absurdities his ill-regulated fancy carried him is best shown by the extraordinary fact that in his "Confessions" he declared Christ the first and greatest Grand Master of masonry. In 1805 he was translated to Berlin as clerk in some state department, but some time after resigned and began travelling. He embraced the Roman Catholic faith at Rome, 19th April, 1811. He even took orders, entered for a while the order of the Redemptorists, and in 1814 settled at Vienna, where during the congress he attracted crowds of hearers by his sermons. Werner died 18th January, 1823. His dramatic productions show great poetical talent and energy of language, but are defaced by eccentricity, fatalism, and mysticism. The most renowned among them are—"The Sons of the Valley," "The Cross on the Shores of the Baltic," "Martin Luther," and "The Twenty-fourth of February."

#### WERNERIAN. See NEPTUNISTS.

**WESEL**, a strongly fortified town of Rhenish Prussia, in the government and 31 miles north-west of Düsseldorf, at the confluence of the Lippe with the Rhine. The chief buildings are several churches, the Rathhaus, the government house, and the gymnasium. It is a very old town, and was formerly a member of the Hanse League. There are manufactures of cotton and woollen goods, of tobacco, and of chemical products; also dyeworks and distilleries. The shipping is considerable. The population in 1880 was 20,593.

**WESER**, the ancient *Uisurgis*, a river of Germany, formed by the junction of the Werra and the Fulda. The Werra rises in the Thüringervald, a few miles north-east of the town of Hildburghausen. Its course is generally north-west, past Meiningen, across the principality of Eisenach, the eastern part of Hesse Cassel, and the province of Göttingen, where it joins the Fulda, after a course of 175 miles, about 100 of which are navigable. The Fulda rises on the north-western slope of the Rhöngebirge in Bavaria, drains the greater part of Hesse Cassel, in which it passes the towns of Fulda, Hersfeld, and Cassel, and joins the Werra on the Hanoverian frontier, after a northern course of about 100 miles; its largest feeder on the left bank is the Eder. The Fulda is navigable from Hersfeld. The Werra and the Fulda unite their waters under the walls of Münden, and from this point the river is navigable by boats. Hence to its mouth in the North Sea the course of the Weser is winding, but generally N.N.W. It drains the greater part of Hanover, in which it receives the Aller and numerous feeders, and after passing Bremen forms the boundary between Oldenburg and Hanover, for a distance of about 40 miles. The length of the river from Münden to the sea is 250 miles. Its upper and middle portions are often rendered impassable in the summer by the sandbanks. Five miles below Bremerlehe a harbour is constructed at the mouth of the river for the accommodation of vessels of large size. A canal connects the river with the Elbe.

**WESLEY**, the surname of a remarkable family, of which one member, John Wesley, was the chief founder of the religious movement described under **METHODISM**.

The first calling for notice in order of time is **SAMUEL WESLEY**, an English clergyman, born in Preston in 1662, 1666, or 1668, according to different authorities. He was a son of one of the nonconformists of 1662, but early in life he abandoned dissent, obtained education at Oxford, and taking orders, served a curacy in London for a year, and was then for another year chaplain on board a man-of-war. He was again a London curate for two years, during which he obtained some reputation as a writer of political lampoons, married, and was presented by his wife with the first of nineteen children in his son Samuel. His first

preferment was to the poor living of South Ormesby, which was exchanged about 1693 for the better endowed and more comfortable rectory of Epworth, Lincolnshire, to which, in 1723, was added that of Wroote, in the same county. He wrote a heroic poem on "The Life of Christ" (fol. 1693); "Elegies on Queen Mary and Archbishop Tillotson" (fol. 1695); "The History of the New Testament attempted in Verse" (1701); followed by a similar history of the Old Testament (1704); a poem on the battle of Blenheim (1705), which obtained for him the favourable notice of Marlborough; a Latin Commentary on the Book of Job (edited by his eldest son, 1735); and a "Treatise on the Sacrament." According to his son John he wrote the defence delivered by Dr. Sacheverell before the House of Lords. He was a man of much piety and usefulness, but his life was clouded by a constant struggle against poverty, the stress of which continued until his death, 30th April, 1735.

**SUSANNA WESLEY**, the wife of the foregoing, was a remarkable woman, who contributed much to the formation of her husband's and children's character. She was the twenty-fifth and youngest child of Dr. Samuel Annesley, a nonconformist minister, but like her husband, she had in early life conformed to the church. A woman of strong understanding, good education, and firm will, she struggled hard, often almost hopelessly, to make both ends meet, and to provide for the wants of a large and constantly increasing family, attended to their education, and watched over their welfare with the most fervent earnestness and devoted piety. She survived her husband seven years, of which the three last were spent with her son John, who installed her as mistress of his home at the Foundry, in Moorfields. She died 20th July, 1742, at the age of seventy-three, her body being laid to rest in Bunhill Fields, not far from the grave of John Bunyan.

**SAMUEL WESLEY**, eldest surviving son of the foregoing, was born at Epworth in 1690 or 1692, and was educated at Westminster School and at Oxford. After taking his degree he was appointed usher of Westminster School, an office which he occupied for nearly twenty years. Some witty attacks upon Sir Robert Walpole prevented his appointment as second master of Westminster, but at the age of forty-two he accepted the head-mastership of the free school at Tiverton, where he died, 6th November, 1739, aged forty-eight years. A collection of his poems, containing some remarkable, humorous pieces, appeared in 1736. He viewed the proceedings of his brother John with much disapprobation, and wrote a letter of remonstrance to his mother when he found she "had become a member of Jack's congregation."

**JOHN WESLEY**, the most illustrious member of the family, was born at Epworth, 17th June, 1703. He received his first education from his mother, and in his eleventh year became a pupil of the Charterhouse, London, whence he proceeded in his seventeenth year to Christchurch, Oxford. According to his official biographers, Coke and Moore, after having taken his degree of B.A. he was elected fellow of Lincoln College in 1724, was ordained deacon by Potter, then bishop of Oxford, afterwards archbishop of Canterbury, in 1725, and graduated as M.A. in 1726. From his earliest years he had been of a serious temper, and more especially from the commencement of his residence at college, religious impressions had taken a strong hold upon him. From about the time he was ordained he began to keep a diary, a practice which he continued to the end of his life. A large portion of it, under the title of his "Journal," was published by himself, and is still kept in print by the Methodist societies. It is a singularly faithful record of his mental impressions and religious feelings. Shortly after his ordination he went to officiate as curate to his father at Wroote, and here he resided for about two years, during which time (in 1728) he



received priest's orders. About the end of the year he was summoned back to Oxford in consequence of a regulation that such of the junior fellows as might be chosen moderators should perform the duties of their office in person. Here he found a few young men, including his brother Charles, had formed themselves into a little society for the cultivation of a deeper religious experience, and of these and some twenty others, who were subsequently added, Wesley soon became the acknowledged leader. The two Wesleys, with James Harvey, the author of the "Meditations," and George Whitefield, who shares with Wesley the fame of having been one of the chief founders of Methodism, were the leading spirits of this little coterie. The members of this society spent much of their leisure time in religious exercises, in visiting the poor, the sick, and the prisoners, and they received from their fellow-students the derisive appellations of the Bible Bigots, the Godly Club, the Holy Club, the Sacramentarians, and the Methodists, the latter name being the only title to survive.

It was very soon after this event that John Wesley and his brother Charles became acquainted with William Law, the author of the "Serious Call" and other similar works, whose conversation and writings, harmonizing in the main with their own previous notions and feelings, exerted a powerful influence over the two brothers. Meanwhile the less ardent or resolute of their Oxford associates dropped off one by one; and the number, which had at one time been twenty-seven, declined at last to five. A few months after his father's death John Wesley was induced to go out with General Oglethorpe to Georgia, in North America, to preach to the settlers and Indians in the colony which the general was founding there. He and his brother Charles, who now took holy orders, sailed from Gravesend 11th October, 1735, in the same vessel with a party of twenty-six Moravians. They anchored in the river Savannah, 6th February, 1736.

Charles Wesley returned to England, sent home by Oglethorpe with despatches, early in the next year. The rigid ecclesiastical discipline which John attempted to enforce in the colony was highly distasteful to many of the settlers, and he became involved in a suit for defamation, which, though it was never brought to an issue, yet made his position a very unpleasant one, and finding his prospects of usefulness wholly clouded, he returned to England on 1st February, 1738. While he had been abroad, the religious excitement, which now began to be generally known by the name of Methodism, had made great progress in London, Bristol, and other parts of the south of England, under the impulse of the enthusiastic preaching of Whitefield, who had sailed from the Downs for Georgia only a few hours before the vessel which brought Wesley back cast anchor there. As soon as Wesley arrived in London he hastened to renew his connection with the Moravians. It was not, however, till some months afterwards, on the evening of 24th May, 1738, at a meeting of the Moravian society in Aldersgate Street, that, according to his own account, he for the first time attained to true scriptural conversion.

About three weeks after his "new birth," 15th June, 1738, he set out for Germany to visit the Moravian brethren at their original seat of Herrnhut, where he had some earnest conversations with Zinzendorf, returning to England in September.

Whitefield came back to England in the latter end of the same year, and he and Wesley immediately again became intimately associated. The example of preaching in the open air, first set by Whitefield, 17th February, 1739, was shortly after followed by Wesley at the same place, the neighbourhood of Bristol. The original meeting-house for the Methodists was commenced in the Horse Fair, near St. James' Church, Bristol, 12th May in that year. Lay preaching, of which the first example had been set by an individual name Bowers, in Islington churchyard, after a

sermon by Whitefield, was, not without some hesitation, sanctioned by Wesley soon after his return to London in the autumn.

In the November of 1739 he opened the Foundry Chapel in Moorfields, London, and this became the headquarters of the Methodist movement. Here was organized the first "society," consisting of eight or ten persons who came to Wesley and "desired him to spend some time with them in prayer, and advise them how to flee from the wrath to come." During the year 1739 also he began a series of publications for the exposition of his views, for the encouragement and instruction of the "societies," and for the defence of his course against opponents. About this time the doctrinal differences between himself and the Moravians became so serious that he made a formal and solemn separation from them in July, 1740. Up to this period he had worked hand in hand with George Whitefield, but Wesley was an Arminian and Whitefield a Calvinist, and in 1740 Wesley published a sermon on "Free Grace," which resulted in a temporary alienation between them and the foundation of the Calvinistic Methodism of Wales and Lady Huntingdon's Connection in England. From this period there were two distinct movements—the Calvinistic, led on by George Whitefield; and the Arminian, by Wesley.

The work, however, had now assumed such proportions as to engross the whole of Wesley's time and ability to sustain. Gathering round him a band of devoted helpers, he gradually extended his ministrations until they embraced the whole of England and a large portion of Ireland, Scotland, and Wales. To plant, sustain, and enlarge his "societies" became the object of his life, not with any idea of personal aggrandizement or ambition, but as the means of saving men from sin and its consequences here and hereafter. The greater part of each year was spent in journeying from place to place in his vast parish, and while he seldom travelled less than 40 miles a day, generally on horseback, it is said that not an instance is recorded of his being detained through yielding to the inclemency of the weather. On these journeys and when in London he was accustomed to preach twice or three times a day, and four times on Sunday, and this in addition to meeting and exhorting the societies. As a preacher he was destitute of the impassioned eloquence of Whitefield, but his style was clear, fluent, argumentative, searching in its application, and always adapted to the capacity of his hearers. He retained the management of the cause very largely in his own hands, and in this department of work his skill in organization and arrangement amounted to positive genius. He was besides a voluminous writer, devoting from time to time a few days or longer to the labour of composition, and in this way he contrived by works edited, translated, and original, to cover a very wide range of topics, including theology, philosophy, history, poetry, polemics, experimental piety, and records of his personal experiences. In common with his preachers he had to endure considerable opposition, and several times his life was endangered by mob violence, but during the later years of his life this passed wholly away, and his name was held in honour by all classes of society. For an account of the growth of the society he founded, see under METHODISM.

About the year 1750 Wesley married Mrs. Vixelle, a widow lady of cultivated understanding and independent fortune. She was, however, a woman of jealous temperament and unreasonable temper, and the alliance turned out an unhappy one. Wesley, who had stipulated that he should not change his habits with his condition, was little at home. The end was, that after his wife had several times run away from him and been induced to return, she repeated the experiment once too often, and was not invited to come back. In spite of his incessant labours, the vigour of his constitution, the elasticity of his mind, the tranquillity of his temper, his unflinching hopefulness, his habits of strict temperance, and



his abundance of open-air exercise combined to exempt him from the usual infirmities of age, even to so late a period as his eighty-fourth year. After that period, however, his strength declined, and though he continued to work three years longer it was with diminishing powers, and on 2nd March, 1791, after a short illness, he died at his house in London, conscious up to the last of his approaching change, and praising God with a joy approaching to ecstasy with his latest breath. His body was buried in the small burying ground at the back of the City Road Chapel, London. A monument to him and his brother Charles was unveiled by Dean Stanley in Westminster Abbey, 30th March, 1876.

John Wesley possessed an apostolic zeal, an extraordinary power of organization, and a most exceptional influence and control over men. His diligence was amazing, and it has been computed that during the sixty-five years of his ministry he travelled about 270,000 miles, and delivered over 40,000 sermons, besides addresses, exhortations, and prayers. He was little of stature and had a mild and grave countenance, which in old age appeared extremely venerable. In society his manners were polite, and he displayed much good humour and cheerfulness, gloom and austerity being quite foreign to his nature. Dr. Johnson gave him high praise for his conversational powers, but complained that he was always in a hurry and would never stay beyond the time he had allotted "to have his talk out." He was also extremely benevolent, and during the whole of his ministry he kept his personal expenses within very narrow bounds in order that he might give in charity the major portion of his income.

A collection of his works appeared during his lifetime (thirty-two vols., 12mo, 1771-74), and another in 1809 (sixteen vols., 8vo). A thoroughly corrected edition and the best, was prepared by Thomas Jackson, D.D., in 1831. The life of Wesley has been written by Thomas Coke and Henry Moore, to whom all his manuscripts were left (8vo, 1792); by Whitehead (1793-96); Robert Southey (two vols., 8vo, 1820; several times reprinted); Moore (1824); Richard Watson (1831); Miss Wedgwood (one vol., London, 1870); and L. Tyerman (London, 1870; third edition, 1876). The last is the most full and complete in its information, but the author, in his desire to fill in the details of his picture, has given undue prominence to foibles and weaknesses, and has brought to public view what just biography permits to be kindly veiled.

CHARLES WESLEY, younger brother of the preceding, was born at Epworth, 18th December, 1708. He was educated at Westminster School and at Oxford, where he took orders. He had begun evangelical work before his brother returned from Georgia, and after that event he entered with John upon the itinerant ministry. After his marriage in 1740 he confined his labours mostly to London and its vicinity. As a hymn writer he takes very high rank, and his contributions to sacred song are esteemed by Protestants of all denominations. He died in London, 29th March, 1788. He left two sons, Charles and Samuel, who are noticed in the next article. See Stephenson's "Memorials of the Wesley Family" (London, 1876.)

**WESLEY** was the name of three excellent English musicians.

CHARLES WESLEY (1757-1834) was the son of Charles Wesley, the "sweet singer," who was of considerable assistance to his brother, the famous John Wesley (see the previous article), whose nephew the present Charles Wesley therefore was. Even before he was three, young Charles Wesley could pick out a tune and invent an accompaniment to it on the harpsichord. This precocity was not borne out in later life, though he became an organist of great merit and wrote moderately well.

SAMUEL WESLEY, his younger brother (1766-1837), was a far more notable man. He, too, was precocious as a child, and when he was eight composed parts of an

oratorio, besides playing the violin and organ in public. A severe fall and injury to his skull disabled him for seven of the best years of his life (1787-94), and left him permanently eccentric and wayward, or we should, doubtless, have had a second Purcell. For when he was able to work at music again, Samuel Wesley advanced with great strides. His first object was that of becoming intimately acquainted with the compositions of the great Bach, whose stupendous power he rightly appreciated, though at that time he was scarcely known in England. In 1810 he published a most excellent edition of Bach's immortal forty-eight preludes and fugues ("Das Wohltemperirte Clavier"), in which Horn was his collaborator. By ingenious marks, the structure of these marvellous pieces of musical "form" is clearly indicated, and, in fact, the whole labour of editing is most conscientious. The effect of this work was enormous. It quite made an epoch in English serious composition. In 1820 he got Forkel's "Life of Bach" translated. In 1811 he conducted the Birmingham festival, and at this time his organ-playing, extempore or from notes, was acknowledged to be the best ever heard in England. It is, in fact, to Wesley and his worship of Bach that we owe our solid style of organ playing. From 1816 to 1823 he was again disabled, and yet again in 1830. He rarely appeared in public afterwards. In 1837 he was last seen at the organ. Mendelssohn was playing at Christ-church (the "Blue Coat School"), and old Wesley went to hear him. He was asked to play a little himself, and did so. He was dead within a month of that time.

Samuel Wesley's compositions are exceedingly good. One motet of his, "In Exitu Israel," is as good of its kind as ever was written. Several masses, motets, and antiphons were written for the Catholic service, of which he was always a great admirer, though he denied having ever ceased to be a Protestant. A few anthems and many hymn tunes ("Parochial Psalm Tunes") he wrote for the English church, several excellent glees, and a large number of voluntaries and pianoforte pieces, with a few pieces of instrumental chamber music now forgotten. Whatever he did was always solidly written and of the best, though he rarely rose to the real genius displayed in "In Exitu." During the long career of Henry Leslie's Choir, this remarkable work (for double choruses, unaccompanied, and fugal throughout) was heard at least once a year, and was frequently redemanded in spite of its important length. It is probably the grandest piece of church music England has ever produced, unless we are bold enough to claim the immortal Handel as an Englishman.

SAMUEL SEBASTIAN WESLEY, Mus. Doc. (whose second name is that of the great Bach), was the third son of Samuel Wesley, and inherited much of his father's great power. He was born in 1810 and died in 1876. After diligent study as a youth, he attained the honourable post of organist of Hereford Cathedral, at the early age of twenty-two, and conducted the festival of the three choirs there in 1834. In 1835 he was transferred to Exeter Cathedral, and in 1842 became organist of Leeds under Dr. Hook (afterwards so well known as Dean of Chichester, and the historian of the archbishops of Canterbury). In 1844 he took his doctor's degree at Oxford, writing as an "exercise" his noble eight-part anthem, "O Lord, Thou art my God." In 1849, with a view to the education of his sons, he accepted the organ at Winchester Cathedral, and finally he became organist at Gloucester in 1865, and once more conductor (in his turn) of the festival of the three choirs. In recognition of his great services to church music, Mr. Gladstone, then prime minister, awarded him a pension of £100. He remained at Gloucester till his death. His fine extempore playing, unrivalled in his day, was held by some to be almost equal to his father's; and he was also a worthy son of Samuel Wesley in his many excellent anthems. (Twelve of the best appeared in one

volume in 1851.) One has been mentioned by name, and another may here be quoted—viz., the exquisite little anthem, "Thou wilt keep him in perfect peace," as among the few absolutely faultless compositions of its kind, in a style peculiar to England. He also wrote several cathedral services (one especially noble and elaborate, in E major) and a little organ music, all of great merit. His writing was quite the best of his own time, and continued the fine solid style of his father.

**WESLEYAN METHODISTS.** See METHODISM.

**WESSEX**, one of the early English kingdoms of Britain, to which, gradually, all the other kingdoms became subordinate, was the special conquest of the West Saxons—that is, of that tribe of Saxons whose British territory lay more to the west than those of South-Sexe (Sussex), or East-Sexe (Essex). Kent (Jutes) and Sussex (Saxons) were the first English conquests. Wessex first began in 495, when Cerdic and his son Cynric sailed up Southampton Water as caldormen of a Saxon host, and gained a footing by the slaughter of 5000 Britons. Their conquests became so extensive that Cerdic took the title of king in 519, being elected thereto by the unanimous vote of his people, according to the English Chronicle. Probably he adopted this title when he had finally defeated King Arthur, whom the myths give us as his native opponent, and to whom tradition grants one great victory over the invaders, at Mount Badon, in this year. Our gracious queen is directly descended from this English invader and first English king, by the marriage of the Norman, Henry I., king of England, with Matilda, the heiress of the long English line of Cerdic. Still Wessex remained a coast-kingdom only, until 552, when the capture of the fortress of Old Sarum threw open the downs of Wiltshire to the invaders, who at once pushed along the Avon, under King Ceawlin, driving the Britons before them at Barbury Hill, and sweeping down upon the rich lands of Severn. Finally, by the great victory of Deorham, in 577, Gloucester, Cirencester, and Bath, three petty British kingdoms, leagued to oppose their onset, were entirely annihilated, and the men of Wessex marched across England to Chester. They soon gave up their conquests in this direction, and returning to the Bristol Channel struck eastward to the Thames valley. Here King Cuthwulf, by a rapid march, possessed himself of Oxfordshire and Berkshire, and then for a long time the work of Wessex was to consolidate this great dominion.

The Saxons herein spoken of were that branch of the English nation which inhabited Holstein and the flats of Friesland, and dwelt along the banks of the lower Elbe. To the north of them, in the peninsula of Sleswig, lay the Angles (Englisc), who gave their name to the whole nation, and at the extremity of the peninsula lay the Jutes. Roughly speaking, the latter conquered Kent, the Angles Northern Britain, and the Saxons Southern Britain. This was more than a mere conquest, it was almost an extermination, and the English race replaced the British as dwellers in the land, driving a wedge of heathendom through the Christian world, and cutting off Ireland from the Christians of Gaul, and so of Rome.

King Ceawlin's victory of Deorham had fixed the western frontier of the English; beyond that, in Cornwall (West Wales) and Wales (North Wales), lay what remained of the original British inhabitants of the land. Hence the Welsh call all Englishmen "Saxons," since these were the first division of the English with whom they were so unhappy as to make acquaintance. The early position of Wessex also explains how Gloucester and Buckingham have a Saxon and not an Anglian accent, although, on the formation of the Anglian kingdom of Mercia, both these counties fell to that, and fell away from Wessex.

The first English kingdom to become Christian was Kent (596), and the next was the rapidly-advancing

Northumbria, which, on Eadwine's accession in 617 (soon after which he and his people were converted), definitely asserted overlordship in England. Wessex was the last kingdom to keep its independence, but eventually, after a fierce struggle, it succumbed to Eadwine (626). As one result it became Christian, and the first Christian king of Wessex was Cwichelm, who founded the bishopric of Dorchester (Oxfordshire) in 639. His son, Cenwealh, who for a time relapsed into heathendom, eventually founded the bishopric of Winchester, which quickly rose to that prominence in the west of England which it has retained to this day.

Following the overlordship of Northumbria came that of Mercia, which may be dated from the great disaster at Nectansmere in 685, but Mercia had long been gradually growing, chiefly at the expense of Wessex, now definitely driven south of the Thames. Nevertheless, Wessex under Ini (688-726) gained strength by consolidation and by wise government, and it is to this king that we owe our first definitely formulated code of laws, a most interesting collection. Ini was decidedly the greatest of the early kings of Wessex. In 726 he abdicated and made a pilgrimage to Rome, where he died. In 802, the good effect of Ini's organization of Wessex was seen, for in that year died King Brihtic, the son-in-law of the Merian overking or Bretwalda, the great Offa; and the Frankish emperor, Charles the Great (Charlemagne), who had a long pending struggle with Mercia, aided his friend Egberht, or Egbert, in his candidature for Brihtic's throne of Wessex, and in his immediate revolt against Mercia. (Offa had died in 796, and his successor, Cenwulf, was not equal to his great task.) Egberht, in common with many other disaffected English princes, had taken refuge in the Frankish court, and had learnt there the arts of war and of government, as they were best known in that time. He was of the royal blood of Cerdic, and a most capable prince. It was not long before the whole south of England, and East Anglia in addition, acknowledged not only his supremacy as overlord, but his absolute kingship. Before his death, in 837, he was acknowledged also as overlord of all the rest of England, and that with a more absolute power than any previous Bretwalda. It was not long, however, before the Danes tore away the entire north from the overlordship of Wessex, and at the peace of Wedmore, in 879, Alfred the Great, nominally king of England, definitely gave up all but the Wessex of Egberht to the Danes under Guthorm. But Wessex now stood for England, and henceforth disappears as a name. Eventually Edgar (958-975), with the help of St. Dunstan, reconquered his country from the Danes, and was the first king who actually reigned over all England.

**WEST, BENJAMIN**, president of the Royal Academy, one of the chiefs of the English school of historical painters, was by birth an American, though English by descent. He was of Quaker parentage, and was born at Springfield in Pennsylvania on the 10th of October, 1738. While yet young, West set up as a portrait painter, first at Philadelphia, then at New York. In July, 1760, he went to Italy for three years. He then determined to return home, and arrived in England in 1763 on his way. Dr. Drummond, archbishop of York, introduced West to the king, George III., and his casual visit proved to be a life-long stay. He was from that time almost exclusively employed by the king for upwards of thirty years, until 1811, when he had his last interview with his royal patron. The painter, however, seems to have been a guinea by the loss of the illustrious patronage, upon which he had so long depended. West received on an average above £1000 a year from George III., which was a considerable income at that time. His best pictures, however, and his largest prices belong to the period subsequent to the year 1811, such as "Christ Healing the Sick" (in the National Gal-

lery), "Christ Rejected," "Death on the Pale Horse," &c. He was one of the original thirty-six members of the Royal Academy, established in 1768; and in 1792 he succeeded Sir Joshua Reynolds as president, a position he held till his death on the 11th of March, 1820. One of the best works of the painter is the familiar "Death of General Wolfe." This last composition, painted twice by West, the picture at Hampton Court being a repetition of the Grosvenor example, created a wholesome revolution in the matter of costume in English art. Our officers were till then painted as Greek and Roman heroes, under the false impression that to encase a hero in a coat and trousers was an absurdity. Sir Joshua Reynolds objected at first; but when he saw the picture finished he admitted his error. To depict a man in any but his own clothes would now be extremely ridiculous. West has fallen in reputation, rather than otherwise, of late years. His works are heavy and monotonous in colour and in expression; but he enjoyed a very high reputation among his contemporaries as a historical painter. Historically he is valuable for his earnestness and good example. He has served as a stepping-stone to better things, and it would be ungrateful not to acknowledge our indebtedness to him.

**WEST HAM**, a municipal borough of England, created in 1886, from one of the suburbs of London. It is situated in the county of Essex, on the north bank of the Thames, opposite Greenwich. Its growth is entirely since the beginning of the present century, and in 1881 it had a population of 128,353, almost entirely composed of the industrial classes. They are chiefly engaged in silk printing, brewing, leather-cloth making, and shipbuilding. The borough possesses a town-hall, and the municipality consists of twelve aldermen and thirty-six councillors, including the mayor. West Ham returns two members to Parliament.

● **WEST INDIES** is a term applied to the archipelago which constitutes the eastern boundary of the Gulf of Mexico and the Caribbean Sea, and separates them from the Atlantic. The name was given to the islands by Columbus, who supposed he had reached the confines of India by a western route. It was for some time synonymous with America, until it was gradually restricted to its present signification. Geographers sometimes call these islands the Columbian Archipelago, as nearly all of them were discovered by Columbus himself. They are divided into four subordinate groups: the Bahamas or Lucayas on the north; the Greater Antilles or Leeward Isles, comprising Cuba, Hayti, Jamaica, and Porto Rico, in the north-west; the Lesser Antilles—Caribbee or Windward Islands—stretching in the form of a circular arch from the eastern extremity of Porto Rico to the Gulf of Paria, at the mouth of the Orinoco; and the southern islands, on the Venezuelan coast, the Leeward Isles of the Spaniards. There are in these groups five large islands, Cuba, Hayti, Jamaica, Porto Rico, and Trinidad; about forty much smaller, and a vast number of mere rocky islets, coral reefs, and sandbanks.

The most northern portion of this archipelago, or that part which is north of 20° N. lat., rests on a great coral bank, which is intersected by arms of deep water. The extensive banks which surround the greater part of CUBA prove that this island also rests on a similar basis to that of the Great Bahama. The mountainous portion of Cuba evidently belongs to another region, which extends eastward through St. Domingo as far as the VIRGIN ISLANDS. The strait lying between Virgin Gorda and Anguilla separates this district from the islands of volcanic origin, which extend from 12° to 18° 20' N. lat., and between 60° 50' and 63° 10' W. lon. in a curved line. Tobago and Trinidad, which are still further south, consist chiefly of primitive rocks. The West Indies thus vary greatly in structure and appearance. Many are bold and mountainous, while

others are low and flat. Some of them exhibit both coralline and volcanic rock in alternate layers.

*Climate and Productions.*—All the islands, with the exception of the most northern Bahamas, are within the tropics. The year is divided into two seasons, the dry and the wet. In fact, all the islands which are south of 18° N. lat. have two dry and two wet seasons, and this is also the case with the southern shores of Porto Rico, Hayti, and Jamaica. On Cuba and the northern coasts of the other Greater Antilles and the Bahamas the seasons are not so distinctly marked. The mean annual temperature is 78° Fahr. When the sun is in the southern hemisphere the West Indies enjoy the full benefit of the trade winds, blowing from N.E. and E.N.E., and diffusing over them a refreshing coolness. But when it has passed the equator these retire to the northward as far as 15° or 16° N. lat., and are replaced by south-east winds, which are hot, but usually gentle. The heat at this time is excessive in the low grounds at a distance from the sea, but near the coast refreshing breezes are felt in the afternoon, when they are most needed. Snow is never seen, even on the tops of the loftiest mountains, but there are slight frosts sometimes. The nights are exceedingly beautiful, owing to the transparency of the atmosphere. Hurricanes are frequent from August to October, and earthquakes occasionally occur. Some of the islands are also often devastated by yellow fever.

The currents which flow around the West Indies, and between them and the mainland, are described in the article ATLANTIC OCEAN, and under the names of the principal islands. The chief articles of cultivation are sugar and coffee, both introduced by Europeans. The first sugar was produced in Hayti. As early as 1518 the Spaniards had numerous sugar-presses in operation there. From thence the manufacture spread to the other islands. Coffee found its way to the West Indies from Ceylon and the Isle of Bourbon about the middle or towards the latter end of the sixteenth century. The other more important productions are molasses, rum, pimento, tobacco, cotton, logwood, indigo, cochineal, mahogany, lignum-vita, various dye-woods, copper, and an immense variety of tropical fruits.

All the principal islands are described in separate articles. Their total area is estimated at 92,000 square miles, more than one-half of which has long been held by Spain, while nearly another third, in Hayti (or St. Domingo), is independent, but remained down to the close of the last century divided between France and Spain. Great Britain possesses the next largest share, about one-seventh; and comparatively diminutive portions belong to France, Holland, Denmark, and Sweden.

*Inhabitants.*—The original inhabitants of all the West Indies are extinct, with the exception of a few families of Caribs on the islands of St. Vincent and Trinidad. The present population is composed of whites and negroes (the former imported from Europe and the latter from Africa), and the offspring of these two races. In the British West India Islands the negroes constitute about three-fourths of the population. In Hayti both races are so mixed that the bulk of the people are considered mulattoes.

Since the abolition of negro slavery in the British West Indies in 1834 coolies from India and liberated Africans have arrived there to assist in cultivating the sugar estates. Slavery was abolished in the Dutch possessions on the 1st July, 1863.

**WESTBURY**, a market-town of England, in the county of Wilts, situated on the Great Western Railway, 110 miles from London, and 21 miles north-west from Salisbury. Westbury Leigh forms a small suburb, separated by an open space from the principal street of Westbury. The church is a large building of the thirteenth century, with a central tower, and was restored in 1863. There are several dissenting chapels, an endowed school, a handsome town-hall, benevolent institutions, some small

manufactures of kerseymeres, broadcloth, and leather gloves, and a considerable trade in malt. Iron ore of good quality is found near the town, and there are extensive smelting works. The lord chancellor so well known as Sir Richard Bethell derived his title of Lord Westbury from this place. The population of the borough in 1881 was 6014. The town lost its separate parliamentary representation under the Act of 1885. Near the town is a gigantic figure of a white horse cut in the chalk, on the side of a hill, and visible at a distance of 20 miles.

**WESTERN AUSTRALIA**, the largest of the Australian colonies, embracing all the continent west of 129° E. lon. It is bounded on the N. and W. by the Indian Ocean, on the S. by the South Pacific, and on the E. by South Australia. Its coast-line is more than 2000 miles in length, and has several important openings. It is the nearest Australian colony to Great Britain, from which it is 10,950 miles distant; but with an area, including its islands, of more than 1,000,000 square miles, it had a population estimated in 1886 at not more than 35,186—19,989 males and 15,197 females. This small population is owing chiefly to the facts of the non-discovery of gold until recent times, and of the existence of large tracts of desert country in the interior. Thus the longest settled portion is comprised in an area of about 600 miles in length from north to south, by about 150 miles in average breadth, lying between Albany (King George's Sound) in the south and the Geraldine Lead Mines on the Murchison in the north, between about the twenty-eighth and thirty-fifth parallels of south latitude. The settlement of this portion of the colony is now rapidly extending, especially on the western coast. Exploration north of Esperance Bay has led to the discovery and opening out of the Kimberley District. On the extreme north-west coast, also east, west, and south of Roebourne, the country is being settled.

**Mountains.**—Three distinct parallel ranges of mountains form the most distinguishing features, the highest and most easterly having its termination near King George's Sound, and being called the Blackwood Range and the Victoria Range. The highest peak of these does not exceed 2000 feet. The Darling and Roe Ranges, rising to the height of from 1500 to 2000 feet above the level of the sea, lie parallel to the western coast at distances varying from 10 to 25 miles from it. The highest mountains in the colony are Mount William of the Darling Range, situated in the Murray district, about 60 miles inland, with an altitude of about 3600 feet, and Eden's Peak of the Stirling Range, 3420 feet high. No volcanoes, active or extinct, exist in any part of Western Australia, but shocks of earthquake are occasionally felt.

**Islands.**—There are numerous islands, reefs, and islets off the coast, the largest of which is Dirk Hartog, on the western side of Freycinet Estuary. On the north are Bigge Island, several archipelagos, Bathurst Isles, and the Buccaneer group; on the north-west Dampier Archipelago, the Monte Bello Isles, Barrow Island; on the west Bernier Island, Dorre Island, Dirk Hartog, Rottnest Island, and the Wallaby, Pelsart, and other groups; on the south Eclipse Island and the Archipelago of the Recherche.

**Rivers, &c.**—The principal rivers in Western Australia are the Prince Regent, Glenelg, and Fitzroy, flowing north-west; the De Grey, with its tributary, the Oakover, the Yule, Sherlock, Fortescue, Ashburton, Gascoyne with its affluents, the Murchison and its tributaries, Greenough, Swan, Irwin, Warren, Frankland or Gordon, and Pallinup, flowing to the south. The Ord debouches into the Cambridge Gulf. Few of these run all the year, and still fewer are navigable for any great distance.

The general character of the surface of the settled districts is level, often undulating, but never mountainous. The western seaboard is usually a comparatively flat country of a sandy nature, composed chiefly of the detritus of

old coral reefs, which has been again deposited by the action of water: the Darling Range runs from north to south in the central district inland of Perth, and appears once to have formed the coast-line. Taking the whole country from north to south, it may be described as one vast forest, in the sense of "forest" as heavily timbered land. There are considerable tracts of good agricultural land, but stock farming in the south has met with great obstacles from the "poison plant," a scourge from which the northern districts are free. The existence of important pearl fisheries on the coast at Shark's Bay, where there are extensive banks covered with the true Pearl Oyster (*Arlicula margaritifera*), has led to growing settlements. In fact, all along the north-western coast to the north of 25° S. lat. the pearl oyster abounds, and both the pearls and the shells afford a remunerative industry. On the north-western coast, also, between the Murchison and Irwin rivers, large deposits have been found of copper, lead, tin, and coal, but the last is not of good quality.

The Kimberley District, lying north of the nineteenth parallel of south latitude, is a magnificent country, with richly grassed plains, through which the river Fitzroy, navigable during a portion of the year for nearly 200 miles, flows. A large area is adapted for the cultivation of sugar, coffee, and rice. The great attraction of the Kimberley District arises from the discovery of gold in 1886. A large portion of the area between 16° 10' and 19° S. lat. and between 126° 30' and 129° 30' E. lon. is reported to be auriferous, and nuggets of some size have been found. The formation is principally Lower Silurian slate and schist of various kinds, traversed by numbers of quartz reefs. The river valleys and flats are in many places covered with deposits, sometimes very extensive, of quartz gravel, and drift from denudation of the before-named reefs.

**Products.**—Flowers and fruits from all parts of the world flourish; English vegetables grow to the greatest perfection at all seasons of the year. In summer oranges, apples, pears, peaches, nectarines, apricots, plums, figs, almonds, bananas, and pomegranates grow abundantly. Strawberries grow well in the southern districts. The vine is increasingly cultivated, and the colonial wines have a growing consumption. The olive grows luxuriantly. Bees are abundant. The timber is most valuable, and large tracts of country are covered with the jural, classed at Lloyd's with another wood of this colony—karre—next to teak for durability. When properly seasoned it resists the white ant on land and the *Teredo navalis* at sea. It is of the Eucalyptus tribe. The karre trees attain the most enormous heights. The white gum, sandal-wood, raspberry-jam tree (so called from its scent), and the wattle, valuable for its tanning qualities, are also abundant. Wool-growing, however, is the staple industry of the colony, the northern districts, free from the poison plant as they are, being most favourable to stock.

**Government, &c.**—The governor is appointed by the crown. The executive council is composed of certain *ex-officio* members. The legislative council consists of eight official and nominee members, and sixteen elected members, householding of £10 annual value qualifying for the franchise. The revenue and expenditure each exceeds £300,000 per annum. The public debt is £1,000,000, incurred for improved communication and public works.

The total value of imports in 1885 was £654,000, of which Great Britain supplied nearly half, and her colonies the remainder within £8600. The total exports were £445,000, of which about three-quarters were for Great Britain, about one-third of the remainder for her colonies, and £21,000 for foreign countries. In 1888 there were 144 miles of railway open. Western Australia is the oldest but one of the Australian colonies, having been founded in 1829.

**WESTERN EMPIRE**, the historical name for the western division of the great Roman Empire, when the latter was divided, by the will of Theodosius the Great, between his sons Honorius and Arcadius, 395. [See the article **ROME**, where a full list of the emperors will be found. The emperors of the Eastern Empire are given under **GREEK EMPIRE**.] In the middle ages the empire was revived as the **HOLY ROMAN EMPIRE** (see that article), Charles the Great having been crowned Emperor of the West in 800. In 1804, the Emperor Francis II. assumed the title of Emperor of Austria, and the Western Empire became in name, as it had long been in reality, extinct.

**WEST MACCOTT, SIR RICHARD** (1775-1856), a sculptor of moderate ability, but of high reputation with his contemporaries, and intrusted with great works, was a pupil of Canova. He succeeded Flaxman as professor of sculpture at the Royal Academy in 1827. He became R.A. in 1810, and was knighted in 1837. He produced a large number of our monumental statues, especially those in St. Paul's and Westminster Abbey. Other works are the pediment of the British Museum, the large bronze statue of Achilles in Hyde Park in honour of the Duke of Wellington (for which he received £10,000), a copy of the Apollo Belvedere, altered somewhat, the equestrian statue of George III. at Windsor, the frieze on the Marble Arch, the statue of Canning in Palace Yard, and the Duke of York on the top of the column in St. James's Park. His numerous works show no genius, but are not unpleasing; it would perhaps be unfair to criticise him by the better knowledge he himself contributed to produce. One thing he did which should serve to keep his memory green—he was the first sculptor of note to abandon the pernicious use of allegorical figures. Thus, in his monument to Sir Ralph Abercromby in St. Paul's, a Highlander supports the dying general, instead of the usual "Fame" or "Victory," &c., greatly to the advantage of the result.

• **RICHARD WESTMACOTT** (1799-1872), son of the preceding, was also a sculptor. He became R.A. in 1849. He succeeded his father as professor of sculpture in 1856. His best known work is the pediment of the Royal Exchange. He wrote a "Handbook on Sculpture," and some other books on art.

**WEST MEATH** is an inland county of the province of Leinster, in Ireland, bounded by Meath, King's County, Roscommon, and Longford. Its greatest length, east to west, is 10 miles; its greatest breadth, north to south, is 3½ miles. The area is 708 square miles. The population in 1881 was 71,798, of whom more than 90 per cent. were Roman Catholics.

The county is for the most part a gently undulating surface, not rising in any part to a very great height. The whole belongs to the central carboniferous limestone district of Ireland, with the exception of two small districts of yellow sandstone.

The western side of the county belongs immediately to the basin of the Shannon, which forms its western boundary. Lough Ree, the largest of the series of lakes into which that river expands, is also on the western border. This noble sheet of water is 17 miles long from north to south, and of a varying breadth, about 7 miles in one part. Its outline is exceedingly broken and irregular, and its surface studded with a number of small islands finely wooded, some of which have ecclesiastical ruins. The streams which flow into the Shannon or into Lough Ree are all small. There are many small lakes and small bogs.

The central part of the county is drained by streams that empty their waters into several inland lakes, which are connected by small streams with each other, and ultimately with the river Shannon. The chief of these lakes are Lough Sheelin, Owel, Ennel, and Deveragh. These lakes vary from 6 to 2 miles in length, and some of them are studded with small islands.

The eastern and south-eastern sides of the county abound with bogs, and some of them are of very considerable extent. The lakes of Westmeath abound in pike and very fine trout.

The soil comprises heavy loam, light loam, hilly sheep-walks, and a great deal of bog. The chief crops raised by the farmer are oats and potatoes, with some wheat. Flour and meal are manufactured in large quantities. The occupations of the inhabitants are wholly agricultural—chiefly grazing and dairy farming. The long-horned cattle are much valued; some of the best specimens are grazed in this county, and all the stock participate in the blood. The sheep also are of superior breeds.

The Shannon is navigable for steamboats conveying goods and passengers. The Royal Canal crosses this county from east to north-west, and a branch of the Grand Canal proceeds to Kilbeggan. The principal roads are good. The Midland Great Western Railway passes through the county.

Westmeath is divided into twelve baronies and sixty-three parishes. It is chiefly in the diocese of Meath and the Home Circuit; the assizes are held at Mullingar. The county returns two members to Parliament.

*History and Antiquities.*—This county was included in the kingdom of Meath, of which it formed the western division. In common with the rest of that kingdom, it suffered severely both from the ravages of the Danes and from civil dissensions, and was included in the county palatine of Meath, granted by Henry II. of England to Hugh de Lacy. It was the scene of frequent hostilities for several centuries between the native Irish and the English. Westmeath was separated from Meath or Eastmeath in the reign of Henry VIII. In most of the subsequent dissensions it naturally shared the fate of the parent county. There are many vestiges of antiquity scattered through the county, as well as numerous ruins of ancient castles.

**WESTMINSTER**, a city and parliamentary borough in the county of Middlesex, one of the constituent parts of the British metropolis, containing the royal residence, the houses of legislature, the chief public offices of the executive government, and the magnificent abbey church of St. Peter. The population in 1881 was 229,238.

The city appears to have owed its origin to a church erected here by Sæbyht or Sebert, king of the East Saxons (or, to follow Camden, of the East and Middle Saxons), and dedicated to St. Peter. Sæbyht died about the year 616.

The original church seems to have been destroyed by the Danes about the time of Alfred, and it remained desolate until the reign of Edgar, who caused it to be rebuilt, and established in the place, about 958, a Benedictine priory or abbey of twelve monks. In the reign of Edward the Confessor Westminster was the residence of royalty. The palace built or occupied by Edward appears to have been on or near the site of the present houses of Parliament; it has given name to old and new Palace Yard, Palace Stairs, &c. The abbey church of St. Peter, at Westminster, was rebuilt by Edward the Confessor with great magnificence, and that prince, on his decease in 1066, was buried in it.

After the Conquest, Westminster continued to be the usual residence of the kings of England, and St. Peter's Abbey the usual place of their coronation. Edward I. afterwards fixed in the bottom of the inauguration chair a stone which he had brought from Scone in Scotland, the possession of which was thought to secure the throne of that kingdom. William Rufus built a hall as a banqueting-room to the palace, which, restored by Richard I., is the present Westminster Hall.

Henry III. began to rebuild the abbey church of St. Peter, having caused the ancient edifice of Edward the

Confessor to be pulled down in 1245. He had previously built a new Lady Chapel. He was buried in the new church, 1273, and several of his successors on the throne have also been buried there. The new church was not completed until long after Henry's death.

In the reign of Henry VII. the Lady Chapel of St. Peter's, built by Henry III., was pulled down, and in place of it was erected the more extensive and costly structure now known as Henry VII.'s Chapel. This was the last important addition or alteration made in the abbey before the Reformation, or indeed until early in the last century, when the western towers were rebuilt under the direction of Sir Christopher Wren. Since that period the whole of the exterior of Henry VII.'s Chapel and several other parts of the abbey have been renovated, and the chapter-house was almost entirely reconstructed in 1870-72. See the article and Plate V. *ENGLISH CATHEDRAL ARCHITECTURE*, Vol. V.

Westminster Abbey has been made the place of interment not only for many of the kings and royal family of England, but for a great number of poets, statesmen, judges, naval and military commanders, and others, who have made themselves illustrious by their talents or actions. It has been the scene of the coronation of every English sovereign since the Conquest, and was chosen for the thanksgiving service of Queen Victoria's jubilee year, 1887. A good work of reference on the abbey is Stanley's "Historical Memorials of Westminster Abbey."

**WESTMINSTER ASSEMBLY, THE**, is the name given to the assembly of Puritan ministers and laymen (about sixty in all) convoked by order of the Long Parliament in 1643, to consider the then condition of the Church. It had no direct authority, and depended almost entirely on the Parliament which had summoned it; but it included many prominent Presbyterians (Henderson, Baillie, and others), a party of "Erastians" (Selden the lawyer, St. John, Whitelocke, &c.), and several Independents (Vane, Rye, Bridge, Goodwin, Burroughs, and Simpson). They took the Solemn League and Covenant, and ultimately drew up a Directory of Public Worship, to replace the Book of Common Prayer, and the celebrated Westminster Confession of Faith, with a Longer and Shorter Catechism—which were adopted by the Scotch Presbyterians. In 1647 the Scots retired from the Assembly, which gradually fell away until Cromwell's dissolution of the Rump (1652), when it disappeared altogether.

**WESTMINSTER, STATUTES OF.** Four important pieces of legislation bear the name of Westminster.

*The Provisions of Westminster* (1259, reissued in 1262 and 1264, and enacted as the statute of Marlborough, 1267) were rendered necessary by the failure of the provisions at Oxford (1258) to provide remedies against the tyranny of Henry III. In these provisions the barons proposed a speedy remedy for their grievances, the chief of which related to local extortion and to misgovernment. The decision of King Louis of France against these moderate provisions at the *Mise of Amiens*, in 1264, drove the English barons to rebellion, and after the victory at Lewes it was provisionally determined that the king should be advised by a council of nine, nominated by three of the chief barons as electors. Of the twenty-four articles of the Provisions of Westminster, the chief are to exactly define the royal rights over feudal estates, to exempt barons and knights from attendance at the sheriff's court, and from serving on juries, and to amend the legal procedure. The fourteenth article is famous as the germ of the subsequent Magna Carta.

*The first Statute of Westminster* (1275, 3 Edw. I.) is remarkable, as showing the introduction of torture into English jurisprudence as the *peine forte et dure*. It consisted in a rigorous prison discipline and diet, soon developing into the definite form of a heavy iron weight placed

upon the body of the prisoner till he confessed, or if he remained obstinate, he was pressed to death. This last terrible form of the *peine forte et dure* is mentioned specifically by statute in 1407 (8 Hen. IV.) It was not formally abolished till 1772 (12 Geo. III.), and was actually inflicted as late as 1741. It contained fifty-one clauses, chiefly regulating feudal taxes, such as aids and reliefs, checking feudal abuses, providing for freedom of elections, and regulating judicial matters.

*The second Statute of Westminster* (1285, 13 Edw. I.) is famous as establishing entail, which has worked more suffering on Englishmen than even the horrors of torture introduced by its predecessor. This is the statute called *de donis conditionalibus*, and by it lands given to a man and the heirs of his body, with remainder to other persons, or reversion to the donor, could not be alienated by the possessor for the time being, either from his own issue or from those who were to succeed them. It also provided that justices of assize should go circuit to every county twice or thrice a year, and confirmed much previous legislation.

*The third Statute of Westminster* (1290, 18 Edw. I.) is very famous under its Latin title of *Quia Emptores*. Its object was to check the alienating of parts of fiefs by subinfeudation (sub-letting), so that the overlord lost control over his estate. In any case of alienation by a tenant, the tenure was directed to be transferred to the crown or the superior lord. The immediate effect was to largely increase the class of small freeholders holding directly from the crown or the great lords, and thus to weaken the petty baronage, and to establish that important and well-to-do middle class in England to whom her prosperity is chiefly due.

**WESTMORLAND**, a north-western county of England, bounded N.W. and N. by Cumberland, S.W. and S. by Lancashire, S.E. and E. by Yorkshire, and N.E. by Durham. The greatest length, N.N.E. to S.S.W., is about 41 miles; the greatest breadth, at right angles to the length, 32 miles. The area is 500,906 statute acres. The population in 1881 was 64,191.

*Surface and Geology.*—This county is probably the most mountainous in England, and consequently the landscapes everywhere exhibit a grandeur and a wild picturesque beauty which have made them the favourite inspiration of our artists and great poets. The eastern side is traversed by the grand Pennine chain, which forms the boundary between it and Yorkshire; the western side and the centre are occupied by the mountains of the Cumbrian group, which are separated from the Pennine chain by the valley of the Eden, and stretch in a lofty and romantic range from Helvellyn, the highest mountain in Westmorland (3055 feet), to Bow Fell.

The principal ridge of the Pennine chain enters the county to the south of Cross Fell, and extends across Milburn Forest S.S.E. by Brough to the border of Yorkshire in Arkengarth Forest; it then turns S.S.W., and runs, above Kirkby Stephen, to the head of the Eden. On each side of the ridge numerous transversal valleys are drained by small streams: those on the west side flowing into the Eden, those on the east forming the upper waters of the Tees, the Swale, and the Ure or Yore. One of the highest summits of the Pennine chain is the Nine Standards, which rises to an elevation of 2186 feet.

The main mass of the Cumbrian group crosses the county on the south from east to west, beginning near the Nine Standards, at the head of the valley of the Eden, by which it is separated from the Pennine chain. It extends, as already stated, to Bow Fell (2911 feet high), whence it continues to the shores of Ullswater and the valley of the Lowther. Some of its peaks attain a considerable altitude, as at Loughrigg Fell, and display a bold variety of outline. The glens shut in among them are very lovely, and sur-



prise the traveller with a constant succession of new and agreeable pictures. Two small groups of lesser elevation in the south-east form the boundaries of the narrow basin of the Lune.

Geologically the county may be regarded as consisting of three districts. The slate rocks of the Cumbrian mountain group compose the first division; the formations of the great carboniferous and mountain limestone series of the north of England, of which the Pennine chain represents the western outcrop, constitute the second; and the new red sandstone of the valley of the Eden forms the third. Granite occurs in the north, particularly at Shap, where large brilliant crystals of red felspar have been found. Graphite is obtained in large quantities at Borrowdale; and the mineral treasures of Westmorland also include coal, lead, copper, marble, and slate.

**Rivers and Lakes.**—The Pennine chain of mountains separates the waters pouring into the Irish Channel from those which flow into the German Ocean. Westmorland is chiefly on the western side of the mass; but a small portion is on the eastern, and it is here that the upper waters of the Tees have their principal source. All the streams belonging to the eastern slope of the Pennines have scarcely any part of their course in the county, as the ridge which determines the watershed lies very near the eastern border.

On the western side of the Pennines Westmorland is divided by the principal ridge of the Cumbrian groups into two basins. On the north lies that of the Eden, on the south the basin of Morecambe Bay is drained by the Kent, the Lune, and other streams, which flow into that noble estuary.

The Eden rises on the border of Westmorland and Yorkshire, on the side of Hugh's Seat, one of the Pennine Mountains. Its course for the first 2 miles is south; it then abruptly turns to the north, flows north past Kirkby Stephen, and afterwards north-west past Appleby into Cumberland. Its extent in Westmorland is 30 miles; in Cumberland about the same; making a total of nearly 60 miles. It is nowhere navigable in the former county.

The Eden receives several affluents, the chief being the Eumont, which flows from the Cumbrian Mountains into Ullswater at its upper end, and crossing the lake empties itself into the Eden. Its total length, including Ullswater, is about 30 miles. About 4 miles above its junction with the Eden it receives the Lowther. Ullswater, an expansion of the Eumont, is about 7 miles long, with an average width of half a mile. Haweswater is formed by the Mardale Beck, an affluent of the Lowther.

The Lune, the Kent, and the Winster drain the basin of Morecambe Bay. The Lune rises on the northern side of the ridge which connects the Cumbrian Mountains with the Pennine chain. It flows north, then west, and afterwards south, partly in the county, partly on the border, to Kirkby Lonsdale, entering Lancashire a little below that town. No part of its course of 27 miles is navigable. The Kent rises in the Cumbrian Mountains, and flows by the town of Kendal into Morecambe Bay. Its whole course of 23 miles belongs to Westmorland; it is not navigable. The Winster, also called the Pool, rises in this county, and flows along its border by Lancashire into Morecambe Bay.

The large Lake of Windermere, which is so celebrated for its beauties, and enjoys an imperishable renown in the poetry of Wordsworth and the poetic prose of "Christopher North," lies partly in Westmorland and partly in Lancashire. Ullswater, scarcely less famous for its wild sylvan character, forms the boundary between this county and Cumberland. A short distance north-west from the head of Windermere lie the beautiful small lakes of Grasmere and Rydal Water, which have been lovingly described by Wordsworth and Southey; and in the vicinity several

tarns, or very small lakes, are situated, belonging mostly to small valleys or circular recesses. Loughrigg Tarn is perhaps the most romantic.

**Railways and Canal.**—A railway extends from Lancaster through Kendal and Penrith to Carlisle, in connection with the London and North-western system, and a branch from Kendal runs to the eastern side of Windermere. The only canal is the Lancaster, which connects Kendal with Lancaster and Preston.

**Agriculture.**—Although Westmorland, from its mountainous nature, is more interesting in a picturesque than in an agricultural point of view, it contains some very fertile valleys, in which occur many well-cultivated farms. The climate is mild and moist in the low grounds: the high hills condense the clouds which traverse the Atlantic, and cause frequent and abundant rains. These keep the pastures green, but are not so favourable to the ripening of the corn. The average rainfall is about 60 inches per annum. Great quantities of snow accumulate in winter. The mountainous surface is only fit for sheep-pastures or for plantations of timber trees.

The soil in the valleys is mostly a dry gravelly loam, composed of different earths washed down from the hills, and well adapted for the cultivation of turnips, of which great crops are raised on well-managed farms. Towards the east and north the soil is more inclined to clay; and unless this be well drained, the land is too wet, in spring and autumn, to admit of clean and careful tillage. There are some extensive moors in the county—its original name was *West-moor-land*—and wherever the water has no sufficient outlet, basins of peat accumulate; but these are not so extensive as in many other hilly countries, owing to the calcareous rocks which form the substratum of a great part of the hills. These, being porous, prevent the accumulation of moisture, except in those districts where the lakes are situated, which render this county of such interest to the artist and the lover of the picturesque.

From Kirkby Stephen to Brough and Appleby, and thence to Temple Sowerby, the soil is a deep sand, which in a dry country would be very unproductive; but the moist climate of Westmorland renders it more compact on cultivation. Turnips and potatoes grow well when manure is abundantly supplied. Lime, a great improver of the soil, fortunately abounds in the county. Near Kendal a great breadth of potatoes is planted, for the supply not only of the immediate neighbourhood, but also of the adjacent counties, and many thousand loads are annually sent into Lancashire and Yorkshire.

Grass land being abundant, and the climate favourable to pastures, the Westmorland farmer chiefly confines his attention to the breeding of large cattle. Good meadows let at a high rent, and are carefully manured with composts. Large crops of hay are procured in favourable years. Geese are reared in great numbers in the mountain districts, and some of the lakes contain an abundance of fish.

Westmorland is divided into four wards and thirty-two parishes. It is in the diocese of Carlisle and in the Northern Circuit. The assizes are held at Appleby. It returns two members to Parliament.

**History and Antiquities.**—In the earliest historical period this county appears to have been included in the extensive territory of the Brigantes. The Eden, with its estuary, the Solway Frith, is apparently the *Iouana*, and the Bay of Morecambe the estuary of *Moricambe*, of Ptolemy. A number of Roman inscriptions have been found in Westmorland, several of which are preserved in Horsley's "Britannia Romana."

Westmorland was probably conquered by the Angles of Northumbria, under Egfrid, about 685. Absorbed in the Northumbrian kingdom, it underwent the same vicissi-



tudes, though probably saved from the ravages of war by its mountainous character. Its name, as *Westmoringa-land*, occurs but once in the Saxon Chronicle. After the Norman Conquest it was divided into the baronies of Westmorland and Kendal, and a castle erected in the latter locality. Few references to it are found in our early annals, except that it suffered occasionally from the incursions of the Scottish borderers. The earldom of Westmorland was created by Richard II. in favour of Ralph Neville of Raby; it was forfeited by Charles Neville, who was one of the leaders of the great rising in the north against Queen Elizabeth, so picturesquely described by Mr. J. A. Froude in his "History of England."

In the Civil War of Charles I. Appleby Castle was occupied by a royalist garrison, but after a vigorous resistance was eventually compelled to surrender. The influence of the Lowther family has for the last two centuries been paramount in the county, and its annals are, in fact, indissolubly blended with those of its ancient and powerful lords.

**WESTON-SUPER-MARE**, a market-town and watering-place of England, in the county of Somerset, very pleasantly situated on the well-wooded slope of the hills overlooking Uphill Bay, in the Bristol Channel, 138 miles from London, on the Great Western Railway. Its climate is very healthy, and from an insignificant village it has become a fashionable summer resort and favourite watering-place, of which it has all the appliances, with good sands, bathing establishments, and many villa residences. The landing and embarkation of passengers and light merchandise has been greatly facilitated by a pier extending to the rocky island of Birnbeck, and a landing stage has been carried out beyond the island. The local affairs of Weston-super-Mare are regulated by a board of town commissioners, who have erected a large and handsome town-hall. The parish church is an ancient and interesting edifice, besides which there are two or three modern district churches and places of worship for nearly every denomination of dissenters. The other principal public buildings are the market-house, the assembly room, railway station, and some large hotels. The streets are somewhat irregularly laid out, but include several handsome terraces and crescents. A fine esplanade, in the shape of a semicircle, skirts the beach. The tide recedes a long way, leaving a great expanse of sand. The cemetery is pretty and well arranged. There are some potteries in the town; but this is almost the only manufacture. A powerful battery of artillery has been erected on Brean Down, with corresponding fortifications on the Steep and Flat Holms, which are about 3 miles distant; and these, with a battery at Lavernock, on the Welsh coast, protect the entrance to the Severn. The parish of Weston-super-Mare comprises the islands and fishing stations of Knightstone and Birnbeck, and the hamlets of Ascombe and Milton. The total population in 1861 was 8038; in 1881 it had increased to 12,884. A few miles E.N.E. of the town is the famous Banwell Cave.

**WESTPHALIA**, a province of Prussia, having Hanover on the north, Schaumburg-Lippe, Lippe-Detmold, Brunswick, Waldeck, and Hesse-Nassau on the east, Rhenish Prussia and the Netherlands on the south and west. The southern half of the province is mountainous, comprising the Rothaar Gebirge and the Sauerland, the remainder being generally level, except that the Teutoburger Wald skirts the north portion; the north-west is marshy. The principal rivers are the Ems, Lippe, and Ruhr, and the Weser just within and upon its east boundary. The soil is generally fertile, but there are extensive tracts of heath and marsh. Corn, flax, hops, and potatoes are produced; horses, cattle, sheep, and hogs are reared. It has manufactures of linen, cotton, and

hardware. There are mines of iron, lead, and copper; also salt-springs, and extensive beds of coal. Münster is the capital; Dortmund, Bochum, and Bielefeld are other principal towns. The area is 7771 square miles, and the population in 1880 was 2,043,442.

**WEST POINT**, the site of the United States Military Academy, is situated on the right bank of the Hudson, 52 miles north of the city of New York. The natural strength of the place led to its selection for a fortress in the Revolution; and Fort Putnam, erected at that period, which crowns a hill of 598 feet elevation above the river, commanding a fine view, is surrounded on three sides by deep ravines and steep descents. The buildings of the academy occupy a plateau elevated 188 feet above the Hudson, and covering an area of about a mile in circuit, with ample room for the necessary structures, military evolutions, and the practice of gunnery. The approach from the river on the east is interrupted by a nearly perpendicular bank or wall, while on the west and south-west the place is defended by a rampart of high and rugged hills. The Military Academy was established by Congress in 1802, and is wholly supported by the general government. The education given is gratuitous, so far as money is concerned; but each cadet must give his service to the government for a fixed period. The corps of cadets must not exceed 250 at any one time, and the candidates for admission must not be under sixteen or over twenty-one years of age. Each member of Congress has the right to nominate one cadet from his district, and the president appoints ten. The corps must spend three months of each year in encampment. The course of study, which is full and thorough in mathematics and all that pertains to the military art, embraces five years.

**WESTPORT**, a favourite bathing resort and seaport town of Ireland, in the county of Mayo, situated near Clew Bay, 40 miles W.N.W. of Galway. It has English, Roman Catholic, Presbyterian, and Methodist places of worship. The fishery is important, and agricultural produce is exported. The population in 1881 was 4169.

**WETTER LAKE**, in Swedish Gothland, is next in importance to Lake WENER, from which it lies about 25 miles south-east, and with which it is connected by a canalized series of small lakes. It receives no less than ninety small tributaries; its outlet is the river Motåla, which falls into the Baltic. The scenery surrounding it is of a very picturesque character, and its surface is agreeably diversified by several small islands. Its dimensions are—70 miles in length, 13 in breadth, and 370 feet greatest depth. Lying 800 feet above the level of the Baltic, it occupies an area of 850 square miles. Its navigation is impeded by a singularly rapid and violent undulation, which occurs at intervals, and whose cause is not accurately ascertained. It is also subject to alternations of level; but its waters are remarkable for their emerald colour and surprising transparency.

**WETTERHOORN** (i.e. "peak of storms"), a limestone mountain of the Bernese Oberland, 11 miles south-east of the Lake of Brienz. Its height is stated at 12,147 feet. It is remarkable for its savage and romantic aspect.

**WEXFORD**, a maritime county in the province of Leinster, in Ireland, is bounded E. by the Irish Channel, S. by the Atlantic Ocean, S.W. by Waterford Harbour, W. by Kilkenny, N.W. by Carlow, and N. by Wicklow. The greatest length north-east to south-west is about 54 miles, the greatest breadth east to west is about 30 miles. The area is 901 square miles, or 576,588 acres. The population in 1881 was 123,854. In 1861 it was 143,815; in 1841, 202,033. Roman Catholics largely predominate.

**Coast-line.**—The whole line of coast from Arklow (which lies a little north of the northern boundary of Wexford) to Wexford Harbour, presents no opening which can afford shelter from foul weather, except to small craft; and the danger to shipping is increased by a range of sandbanks

which lie parallel to the shore at the distance of a few miles. The navigation of Wexford Harbour is intricate and dangerous; and it is, moreover, obstructed by a bar. From Roslare Point, on the south side of the entrance to Wexford Harbour, to Greenore Point, the coast forms a bay, called Greenore Bay. From Greenore Point, on the south side of the bay, to Carnsore Point (which is the south-eastern extremity of Ireland, being about 50 miles from St. David's Head, in Wales), the coast trends south by west. It then changes its direction, and runs east to west, including two small bays before it reaches Crossfarnogne Point, west of which are Ballyteige and Bannow Bays. From Bannow Bay to the east point of Waterford Harbour it runs S.S.W. On this last part is the small harbour, used by fishing vessels, called Fethard Bay. Off the south coast are numerous rocks and islets. On some of them lighthouses are erected; but they, nevertheless, often prove very fatal to shipping in bad weather. Several lagoons skirt the south shores.

*Surface, Rivers, Geology, and Climate.*—Waterford Harbour and the River Barrow separate Wexford from Waterford and Kilkenny. At the point of junction of the counties of Carlow, Wexford, and Kilkenny, the boundary is distinctly marked by the ridges called Blackstairs Mountains and Mount Leinster, the former of which rise to elevations of from 1520 to 2409 feet above the level of the sea, while the latter has an elevation of 2610 feet. Three remarkable summits upon the mountains between Wexford and Carlow are known as "The Leaps of Ossian's Grayhounds." A few miles west by south of Newtownbarry, on the slope of Mount Leinster, rises the small river Clody, which forms the boundary of the county to Newtownbarry, where, after a rapid course, it falls into the Slaney. From hence the boundary line runs for a short distance up the course of the Slaney, after which it passes along the tributary river Derry to a point a little beyond the junction of the counties of Carlow, Wexford, and Wicklow.

Besides the ridges that form part of the natural boundaries of the county, Wexford contains many hills of considerable elevation, among which are the Forth Mountains, extending 5 or 6 miles from the neighbourhood of the capital, towards the south-east corner, where the surface gradually declines to a level peninsula. The principal river of Wexford is the Slaney, which enters it from Carlow, a short distance north of Newtownbarry, and flows past that town and Enniscorthy to Wexford Harbour. It is navigable for large boats as far as Enniscorthy, to which place the tide flows. The *BARROW* is noticed under that name. The other rivers are small, as are also all the lakes in the county.

Geologically considered, the district forms part of the clay-slate tract that extends along the eastern portion of Ireland from the northern part of Wicklow to the Atlantic Ocean. The clay-slate is found in immediate contact with granite, which forms the chief component of the ranges that separate this county from Carlow. The Forth Mountains consist principally of quartz rock, with occasional laminae of clay-slate. Granite appears about Carnsore Point and at a few other places, and greenstone and porphyry also occur. Limestone is the chief mineral product. Small quantities of lead and copper have been found, but the mines proved unprofitable, and are now closed.

In climate, those parts of Wexford which lie open to the sea are milder in temperature than the adjacent counties of Carlow and Kilkenny. Snow seldom remains on the ground in these districts, and agricultural operations may often be carried on without interruption, while lands 10 miles inland are locked up with frost.

*Soil, Agriculture, and Manufactures.*—The soil is generally of a cold clayey nature, being deficient of a substratum of limestone and limestone gravel; and, generally speaking, the western or inland parts of the county are

inferior in quality to the eastern or maritime portions, although the former have an equivalent for the inferiority of the land in the abundance of turf or peat, which affords fuel for burning the limestone obtained from the neighbouring counties. The agriculture of Wexford is generally in a creditable state, considering the natural disadvantages of the soil; and the interior has a very pleasing appearance when the many trim furze hedges put forth their yellow blossoms. The crops consist of the various kinds of grain, of which barley is the principal, beans, tares, rape, turnips, and potatoes, the last being the staple crop, and that upon which most manuring is bestowed. Considerable quantities of butter, barley, cattle, pigs, poultry, and eggs are exported. The South-eastern Railway is prolonged throughout the county, passing Gorey and Enniscorthy to the capital.

The great extent of sea-coast and the numerous banks in the vicinity render the fisheries of Wexford very important to its population. The coast presents numerous creeks, at which fishermen reside; but there are no harbours suitable for large vessels.

The manufactures of the county are of little importance. Woollen cloths, checks, and coarse linens are made, but on a small scale, and for home use only.

Wexford is divided into ten baronies. It is in the united diocese of Ossory, Ferns, and Leighlin, with a small portion in that of Dublin. Wexford is the county town, where the assizes are held. The county returns two members to Parliament.

*History and Antiquities.*—According to Ptolemy the greater part of the present county was inhabited by the Menapii, whose chief town, Menapia, is supposed to have occupied the site of the present modern Wexford. In the barony of Forth, in the south-east of the county, many Welsh colonists, who had been driven from their own country by the early Anglo-Norman invaders, formed a settlement, and for several centuries their descendants retained the use of their own language (indeed some of the older inhabitants still understand it), and the people are yet distinct in many respects from the rest of the population. Wexford was formed into a county by King John in 1210. In 1649 the whole district was reduced to subjection by Cromwell, who put the garrison of the capital to the sword.

The county, especially the southern part, abounds with antiquities of Danish, Saxon, and Norman origin, though comparatively few can be assigned to a period prior to the arrival of the English in the country. There are several tumuli or raths, and remains of monasteries at Wexford, Enniscorthy, Ferns, Dunbrody, near the confluence of the Suir and the Barrow, Ross, and Clomines. Religious houses were also formerly existing at many other places where no traces can now be detected. Ruins of castellated buildings are numerous.

WEXFORD, the capital town of the above county, and a municipal borough, 73 miles south from Dublin by railway, is situated on the south side of the river Slaney, at its entrance into Wexford Harbour, which is large, but of very irregular form. The entrance is between the extremities of two long, narrow, sandy peninsulas, Raven Point on the north, and Roslare Point on the south, where it is less than a mile wide, but almost immediately it expands to a width of more than 8 miles. The town of Wexford lies about 4 miles from the entrance of the harbour, which contracts so suddenly opposite to it as to be crossed by a bridge 733 feet long, a part of the roadway being made movable to allow the passage of masted vessels into the inner portion of the bay, which again expands, though only for a short distance, to the width of about 2 miles. A bank of shifting sand outside the entrance has been increasing for some years, and it leaves so little depth of water as to render the passage inconvenient, except for small vessels. Great efforts

have been made with a view to the removal of this impediment, but they have been attended with only partial success. Spacious quays extend along the harbour the whole length of the town, and there are a dockyard and patent slip. Outside of the borough is a granite column, in memory of the exploits in Egypt of the army under Abercromby. Wexford is inclosed towards the land by a wall, which was repaired in 1804, at the expense of the corporation. The town is generally well built, but the streets are narrow. It contains two Episcopal churches, three Roman Catholic chapels, a friary, five nunneries, Presbyterian, Methodist, and Friends' meeting-houses, several banks, a chamber of commerce, a Roman Catholic college, schools, county court-house, infirmary, and fever hospital, town-hall, union work-house, a barrack, and theatre. The manufacture of malt is carried on, and the herring, oyster, and salmon fisheries employ many persons. There are a distillery, a brewery, and two steam corn mills. The principal trade is by steamers with Liverpool, the exports consisting of agricultural produce, and the imports chiefly of timber. The borough is divided into three wards, and governed by a mayor, six aldermen, and eighteen councillors. The population in 1881 was 12,163. The town is very ancient, it having been fortified and occupied by the Danes. From the earliest period of the invasion by the English, it was one of their strongholds. In 1798 the insurgents committed great atrocities in it; among other things, drowning many English and Irish Protestant prisoners by throwing them over the bridge.

**WEYBRIDGE**, a village of England, in the county of Surrey, situated at the influx of the Wey into the Thames, with a station on the South-western Railway, 18 miles from London. The church, a Decorated building noticeable for its lofty spire, was erected in 1848, and enlarged in 1861. It contains a monument to the memory of the Duchess of York, by Chantrey. In the Roman Catholic chapel of St. Charles Borromeo are interred the remains of Louis Philippe de Marie, ex-king and queen of the French, and the Duchesses de Nemours and d'Orléans. At Otlands, in this parish, was formerly a stately palace, built by Henry VIII., and the favourite residence of Anne of Denmark. It has entirely disappeared. The mansion, by Wyatt, built by the Duke of York about 1794-1800, has been converted into an hotel. The surrounding grounds are of great extent and beauty. There is an oil mill, and fruit and market gardens. The population of the parish of Weybridge in 1881 was 3027.

**WEYDEN, ROGIER VAN DER**, a celebrated Flemish painter, known to Vasari as Roger of Bruges, or Rogier da Bruggia. He was, however, not of Bruges, further than that he belonged to the school of John Van Eyck there, and was a rival rather than a scholar of that great artist. Rogier was born at Brussels, but the date is not known. He was already established in 1430, and in 1436 was appointed painter to the city of Brussels. In 1449 he visited Italy, and was at Rome at the jubilee of the following year. He returned to Brussels, and died there on the 16th of June, 1464, aged upwards of sixty, and was buried in the Church of St. Gudule. Rogier Van Der Weyden not only improved the taste of the art of his time (and in some of his heads he is more delicate in character even than John Van Eyck), but he also altered the technique. He painted both in tempera and in oil colours, and is said to have been the first to paint on strained canvas instead of panel for pictures. He also painted on fine linen, and we have a very fine example in the National Gallery; it is in tempera, and represents the "Entombment of our Lord." His masterpiece is the "Last Judgment" in the Hospital at Beaune, painted in 1448. His pupils were very numerous; the famous Memling and Schöngauer were among them.

ROGIER VAN DER WEYDEN, the younger, who died at

Antwerp of the *suette* in 1529, was the son and pupil of the preceding. He was a member of the Painters' Guild of Antwerp, and some excellent pictures are attributed to him, as, for example, his own and his wife's portraits in the National Gallery, and the portrait of a lady reading, called the "Magdalen."

**WEYMOUTH**, with Melcombe Regis, a seaport town and favourite watering-place of England, in the county of Dorset. It is 8 miles south of Dorchester, 147 miles W.S.W. of London by rail. Two towns combine to form the municipal borough of Weymouth, and a seaport on the shore of Weymouth Bay, where it communicates by an arm of the sea with a small internal bay, about 2 miles long, called the Backwater, which is an estuary of the small river Wey. The harbour is in the arm of the sea which connects the Backwater with Weymouth Bay, Weymouth being on the south, and Melcombe Regis on the north side of the harbour. A handsome stone bridge crosses the harbour. Weymouth proper has the appearance of an old fishing town, and is uninteresting. Melcombe is situated on a tongue of land between Weymouth Bay and the Backwater, having in front of the bay a broad terrace called the esplanade, a mile long, with a gradual slope towards the sea. Handsome ranges of houses face the esplanade, most of which are occupied by those who resort to the town as a bathing-place, for which it is excellently adapted, the sand being smooth and firm, and the slope gradual. The climate is very mild and equable, hence the winter is almost as much a season for visiting as the summer. George III. had a royal lodge erected here, and his visits were frequent. In fact it was chiefly through his patronage that the town was brought into notoriety, and a statue to him stands on the esplanade. There are assembly rooms, a theatre, a literary and scientific institution, museum, several churches, and places of worship for dissenters. Shipbuilding, rope and sail making, and the export of Portland stone and Roman cement employ most of the labouring population. The harbour has 14 feet of water at full tide, and in the bay there is good anchorage in seven or eight fathoms. The population in 1881 was 13,704. Its separate parliamentary representation ceased in 1885. A line of mail steamers ply between Weymouth and the Channel Islands twice a week. Near Weymouth is the so-called Island of Portland, although it is in reality a peninsula, connected with Weymouth by the Chesil Bank.

**WHALE** is the popular name of most of the large aquatic mammals belonging to the order CETACEA. In a more restricted sense the name is applied to the family Balenidæ or whalebone whales, and especially to the most important member of that family, the Greenland or Right Whale (*Balena mysticetus*). The whalebone whales are remarkable for being entirely destitute of teeth, except in the foetal condition, when minute denticles are concealed beneath the gums. The place of teeth is taken functionally by plates of BALEEN, the whalebone of commerce, which are tegumentary in origin. The baleen plates are numerous, and are embedded in the fleshy membrane of the palate, extending from its middle line on each side of the mouth. They are of dense horny texture, and have their free edges split up into a fringe of fibrous bristles. The mouth of the whale is of enormous capacity, but the aperture of the gullet is extremely small, so that its food is restricted to minute marine animals, which are retained in the meshes of the baleen, being strained out in this way from the water which enters by the mouth, and which then is allowed to escape. The Greenland whale attains a length of, from 50 to 70 feet. The head measures a third of the total length, and passes, with scarcely any appearance of a neck, into the body, which is thickest at about the middle, and then tapers rather suddenly towards the tail. The latter organ is 5 or 6 feet long, and about 20 feet broad—com-

pressed, half-moon shaped, and notched at the centre. The flippers or pectoral limbs are situated about 2 feet behind the angle of the jaws, and measure between 8 and 9 feet in length, and between 4 and 5 feet in breadth. There is no dorsal fin. The eyes are very small, and placed above and rather behind the angles of the mouth. The blowholes, the opening of the nostrils, are situated on the top of the head. The adult is mostly deep velvety black, with the lower part of the throat cream-colour, and sometimes whitish markings on the belly. The young are bluish-gray, and the old animals sometimes become more or less piebald, the black being mixed with gray and white. The skin is naked, except for a few bristles about the jaws. Below the skin is a thick layer of blubber, a network of fibres in which fat is held. The Greenland whale is an inhabitant of the northern seas, chiefly within the Arctic circle. Four other species are recognized closely resembling the Greenland whale in appearance and habits. The Biscay Whale (*Balæna biscayensis*), a more southerly form, differs in having a proportionately smaller head, shorter, thicker baleen, and in the colour of the body being a slightly bluish shade. This is the species that has occasionally strayed to the coasts of Britain. The Japan Whale (*Balæna japonica*) inhabits the North Pacific Ocean. The Southern or Cape Whale (*Balæna australis*) ranges from the Cape seas across the South Atlantic to the coast of South America below Brazil. The South Pacific Whale (*Balæna antipodarum*) inhabits the South Pacific Ocean from South America to the coasts of New Zealand and Australia.

Whales are gregarious, swimming two or three together, or sometimes in greater numbers. The usual rate of swimming is about 4 miles an hour, though when alarmed their pace is considerably increased, and when harpooned they often dive perpendicularly downwards with great rapidity. They usually swim a little below the surface, with the mouth open, when feeding. Their food consists to a great extent of a small shell-less mollusc, *Clito borealis*, which is found in immense numbers on the surface of the ocean in high latitudes. They also feed on small crustaceans, jelly-fish, &c. They usually come to the surface to breathe at intervals of from five to twenty minutes. They remain on the surface about two minutes, during which they "blow" or spout several times. This blowing is merely the act of respiration, the spout of spray which ascends into the air being composed of the air from the lungs condensed and mixed with the surrounding vapour. The female produces one or (rarely) two young at a birth, and displays the greatest affection for her offspring.

The Hump-backed Whales (*Megaptera*), of which there are about four species, also belong to the family Balænidæ, and differ from the species of *Balæna* in having a low dorsal fin, and the skin of the throat and belly plaited with narrow furrows. The best known species is the Long-finned Hump-back (*Megaptera longimana*), the Kepokak of the Greenlanders, which inhabits the North Atlantic. It is not very valuable either for its oil or baleen. Another genus of this family is *Balænoptera*, containing the fin-whales or rorquals. [See RORQUAL.] The whalebone whales have been since early times eagerly hunted for their baleen or whalebone, and also for the oil obtained from the blubber.

**WHALEBONE** (in science *baleen*, in commerce *whale-fin*) is the horny laminated substance found in the mouth of the whale, in two extensive rows, each consisting of upwards of 800 blades or plates, which average 10 feet in length, and are all pieces of whalebone. In colour baleen is not pleasing, being of a bluish or brownish-black, but after boiling it takes both a harder texture and deeper hue. In the preparation it is generally dyed black, to which it takes well, but is not fitted for dyeing in the brighter colours. Chemically speaking, whalebone consists of albumen,

hardened by a small proportion of phosphate of lime. The texture is lamellar, or fibrous, in the direction of its length, so that it is easily divided by splitting. The middle of each blade is of looser fibre than the ends, and presents the appearance of coarse bristly hairs. The peculiarity of its structure renders it applicable for many useful purposes. It may be cut into sticks for the ribs of umbrellas or parasols, made into stay-bones, divided into lengths of what is called bristle bone, for making brushes and brooms, or chimney and road-sweeping machines; into strips for covering whip-handles, walking-sticks, telescopes, &c.; in thinner shavings it may be plaited like straw for hats and bonnets, while the waste is used by upholsterers as stuffing for cushions, and the refuse is sold as manure. The nature of whalebone being something between horn and hair, it cannot be soldered or joined like tortoise-shell, but must be used in distinct pieces. Having been softened by boiling, it is cut into various forms as required, and polished by being scraped with a steel or glass edge, rubbed with emery paper, and finally polished either with a woollen cloth dipped in tripoli powder, or a polishing wheel. As a substitute for whalebone, prepared common horn is the cheapest, but the best for the purpose is a preparation of caoutchouc. The imports of whalebone into the United Kingdom annually average about 2500 cwt., valued at £10,000; but of this quantity about 1000 cwt. are exported.

**WHALLEY**, one of the largest parishes of England, 30 miles in breadth and 15 in length, covering 115,318 acres. The town of Whalley, in the county of Lancaster, 222 miles from London by rail, is of extreme antiquity, being mentioned by its present name in the Saxon Chronicle. It was afterwards the seat of a most powerful and wealthy monastery, the ruins of which still exist. It has a population of 895. Within the parish are included the burgh of Clitheroe, three market towns, eighteen chapelries, thirty-two townships in the county of Lancaster, and small portions of land in the counties of Cheshire and Yorkshire, in both of which the Abbey of Whalley had considerable possessions. It is now intersected by the Liverpool and Leeds Canal, the East Lancashire and the Bolton and Clitheroe railways. Important manufactures of cotton, wool, and worsted fabrics are carried on in various parts of the district, which contains 244,395 inhabitants. Near Whalley is the Roman Catholic College of Stonyhurst.

**WHAMPOA**, a shipping station of China, the port of Canton, situated on an island of the same name in the Canton River between Macao and Canton. It has a fine anchorage and a commodious dockyard.

**WHATELY, RICHARD**, Archbishop of Dublin, a distinguished theologian, political economist, and logician, was born in Cavendish Square, London, on the 1st of February, 1787. From a private school in Bristol he was sent, in 1805, to complete his education at Oriel College, Oxford, where he became the friend and intimate companion of Arnold, Keble, Pusey, and J. H. Newman, all men who subsequently made their "mark" in the church and in the literature of their country. He contributed two noteworthy articles to the *Encyclopædia Metropolitana*, which formed the groundwork of his admirable and well-known treatises on "Logic" and on "Rhetoric." In 1821 he gave to the world his sermons "On the Christian's Duty with respect to the Established Government and the Laws," and the work which first attracted public attention, his "Historic Doubts relative to Napoleon Bonaparte." In this able *jeu d'esprit* he applied to the history of the great conqueror the same *a priori* mode of argument which German criticism had brought to bear on the scriptural chronicle of the Saviour's career. In the following year its author was presented to the vicarage of Halesworth, in Suffolk, and delivered the Hampton lectures at the university, selecting for his theme, and treating it with

conspicuous ability, the "Use and Abuse of Party Feeling in Religion."

In 1825 he was appointed principal of St. Alban's Hall, which a long course of lax discipline had reduced to a sadly disorganized condition. His vigorous management and the influence of his energetic character soon retrieved its reputation. In the same year he published his valuable "Essays on some of the Peculiarities of the Christian Religion," in which his liberal sympathies and breadth of thought were sustained by searching criticism and close reasoning. His "Elements of Logic" appeared in 1826; his "Elements of Rhetoric" in 1828. Both these works speedily became recognized and popular text-books. His mental activity was prodigious; and in 1828 he also issued his cogent "Essays on some of the Difficulties in St. Paul's Writings." In 1829 he was nominated professor of political economy, but after delivering an inaugural course of lectures, he was promoted by Earl Grey, in 1831, to the archbishopric of Dublin—a high dignity which he held, through good and evil report, with moderation, calmness, and scrupulous integrity, while discharging its duties with the vigour and good sense so characteristic of the man. He gave his earnest and unflinching support to the national system of education introduced into Ireland by the Liberal government, and acted as the leading spirit of the Educational Board until 1853, when he resigned, on the ground that the majority were diverging from the principles on which it had originally been constituted. Meanwhile, he was ever active in the promotion of any well-considered scheme for the improvement of the condition of Ireland; and his clarity was as wide as it was judicious and unostentatious. He died 8th October, 1863. His "Life and Correspondence," by his daughter, E. Jane Whately, was published in 1866.

**WHEAT**, the most valuable of cereals, is the name of one or more species of *Triticum*, a genus of GRASSES belonging to the tribe Hordeæ. The genus *Triticum* is distinguished by having a spike, with three- to many-flowered spikelets seated on both sides, one on each notch, of a zigzag jointed stem; the two glumes are placed transversely; the lower palea of each floret is pointed or furnished with an awn of variable length. The species are numerous, some being annual cereals, while others, as the Couch-grass (*Triticum repens*), are perennial grasses, and are either valueless or noxious.

The Common Wheat (*Triticum vulgare*) has a dense four-sided spike, with three- to five-flowered turgid spikelets, having ventricose blunt glumes, with palea awned or awnless, and the grain free. It grows to a height of from 3 to 4 feet, and the spikes or ears are generally 3 or 4 inches in length. Spring and Autumn Wheat, considered by some botanists as distinct species under the names *Triticum aestivum* and *Triticum hybernum*, are only forms of the common wheat produced by cultivation, and differing in their period of growth. They can be readily converted into each other by sowing earlier or later, and gradually accelerating or retarding their growth.

The cultivation of wheat is very ancient, extending probably back into prehistoric times. As the Old Testament records show, it was an important crop in ancient Egypt and Palestine. It was in cultivation in China in the year 2700 B.C., and grains of wheat have been found in the most ancient of the Swiss lake-dwellings. The ancient Greeks regarded it as the gift of Demeter, and the Egyptians attributed its origin to Isis. It is not certainly known in the wild state, though there appears to be some ground for regarding Mesopotamia as its original habitat. The experiments made by M. Fabre about 1855, to show that wheat was only a cultivated form of *Eglops ovata*, a wild grass of Southern Europe and Western Asia, have not been satisfactorily established.

Wheat is now cultivated in most parts of the world.

The limit to its successful cultivation is determined not so much by the cold of winter as by the temperature of summer. It is hardy, and when covered by snow will endure even very severe winters in the north of Europe; but it requires a minimum mean temperature of about 57° Fahr. for three or four months in the year. In elevated situations it may be grown even near the equator; but in general its southern limits vary between 20° and 25° N. and S. lat. In Europe the northern limit is about 60° N. lat. As might be expected from its ancient and extended cultivation, numerous varieties have been established differing in height, habit, and foliage, size and shape of the spike, the number of flowers in the spikelet, the shape and size of the leaves of the florets, the presence or absence of an awn or beard, and the size, form, colour, and hairiness of the grain. There are, however, three different kinds, so different in appearance that they claim peculiar attention. These are the hard, the soft, and the Polish wheats. The hard are the produce of warm climates, such as Italy, Sicily, and Barbary. The soft grow in the northern parts of Europe, as in Belgium, Britain, Denmark, and Sweden. The Polish grow in the country from which they derive their name, and are also hard wheats. It is from their external form that they are distinguished from other varieties. The hard wheats have a compact seed nearly transparent, which, when bitten through, breaks short, and shows a very white flour within. The soft are those usually cultivated in Britain; they have an opaque coat or skin, which, when first reaped, gives way readily to the pressure of the finger and thumb. These require to be well dried and hardened before they can be conveniently ground into flour. The Polish wheat has a long chaff, which is much longer than the seed, a large oblong hard seed, and an ear cylindrical in appearance. It is a delicate spring wheat, and not very productive in the climate of England.

The hard contain much more gluten than the soft wheats. It is this which causes the Italian kinds to be used exclusively for the pastes which form so large a proportion of the food of that nation. Wheats are also classified as white and red wheats, according to the colour of the grain, a difference due chiefly to the soil. The red varieties are generally more hardy than the white, but the grain is inferior in quality and yields less flour.

The soil which is best adapted to the growth of wheat is a deep loam inclined to clay, with a dry sub-soil. But good crops are produced by judicious tillage and manuring, even on light sandy or gravelly and on chalky soils. Wheat is common sown on light soils in a rotation after clover. The seed is either sown broadcast or, preferably, in drills. Artificial manures, as guano and lime, are generally used.

Wheat is the most valuable of all food-grains, as it contains, besides a large amount of starch, nitrogenous and mineral substances required by the animal system. The composition of the grain is on the average in 100 parts—

Water, . . . . .	14.4
Mineral Matters or Ash, . . . . .	2
Albuminoids, . . . . .	13
Carbohydrates, . . . . .	67.6
Crude Fibre, . . . . .	3

The albuminoids vary from ten to twenty-one parts, and the carbohydrates from sixty to seventy. The best wheat yields from 76 to 80 per cent. of fine flour, obtained by grinding the grain in a MILL.

Wheat is subject to several diseases caused by parasitic fungi. The wheat mildew is caused by *Æcidium BERBERIDIS*. [See also BUNT, SMUT, and BURNED-EAR.] The larvæ of the WHEAT-FLY do great damage to the wheat crops, and great alarm was created in England in 1887 by the discovery that its near ally, the HESSIAN FLY, which commits great ravages in the United States, had

become established in different parts of the country. The WIREWORM is another well-known pest, while species of aphides, sawflies, beetles, &c., also commit ravages on crops.

There are several other kinds of wheat which are regarded by some botanists as distinct species. The Spelt (*Triticum spelta*) is cultivated in some parts of the continent of Europe, and is chiefly distinguished by the grain adhering closely to the chaff-scales or paleæ. It yields a very inferior flour, but can be grown readily on poor soils. The One-grained Wheat or St. Peter's Corn (*Triticum monococcum*), which has but one fertile floret in each spikelet, is cultivated chiefly in Switzerland, and yields an inferior flour.

According to the official agricultural statistics, the number of acres devoted to the growth of wheat in 1887 in the United Kingdom was 2,387,518, of which 2,197,380 were in England; 69,407 in Wales; 50,337 in Scotland; and 66,222 in Ireland. The average produce is in—

England and Wales, . . .	28½ bushels per acre.
Scotland, . . . . .	27½ “ “
Ireland, . . . . .	23½ “ “
Great Britain, . . . .	28½ “ “
United Kingdom, . . .	28½ “ “

The average consumption of wheat in the United Kingdom is 5½ bushels per head, and the quantity grown at home is much less than two-thirds that required for the consumption, even with a good harvest. The following table gives the imports of both wheat and flour in quinquennial periods for the last twenty-five years. The fluctuations indicate to a great extent the nature of the home crop:—

## WHEAT.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Cwts.	£		Cwts.	£
1862	41,433,563	23,203,800	1877	54,269,900	33,855,437
1867	31,615,569	21,985,006	1882	61,240,749	34,259,126
1872	42,127,726	26,169,185	1887	65,781,685	21,335,902

## FLOUR.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Cwts.	£		Cwts.	£
1862	7,207,113	5,387,084	1877	7,377,303	6,808,982
1867	5,522,969	3,519,677	1882	13,057,403	10,662,439
1872	4,130,936	4,121,265	1887	18,066,545	10,020,433

The chief supplies of wheat are derived from the United States, Russia, Prussia, and India, and of flour from the United States. The average price of wheat per quarter has varied thus recently:—5*s.* in 1872; 4*s.* 2*d.* in 1875; 4*s.* 1*d.* in 1880; 3*s.* 8*d.* in 1884; and 3*s.* in 1886.

**WHEATEAR or FALLOW-CHAT** (*Saxicola caenetha*), a British bird belonging to the family SYLVIIDÆ, and to the same genus as the STONECHAT and WHINCHAT. It is a summer visitor here, arriving in great numbers on our southern coasts about the middle of March and departing about the end of September. It is abundant in winter on both sides of the Mediterranean, and extends in summer to the extreme north of Europe, the Orkneys and Shetland Islands, and Greenland. It is about 6½ inches in length, with long pointed wings and long legs. The plumage of the male is ashy-brown above; the forehead and throat are white, with a black streak running from the base of the tail and extending beyond the eyes; the wings are black; the rump is white, and the tail is of the same colour, except the tip and the two middle tail feathers, which are black; the under surface is pale buff, lighter on the belly and flanks. The plumage of the female is duller with less black. The wheatear is abundant on downs, pastures, hill-sides, and stony wastes. The nest is placed in old walls, in gravel or chalk pits, or sometimes in a deserted rabbit-burrow. It is composed of dried roots, feathers, &c., and contains five to eight pale blue eggs. Two and even three

broods are usually produced in the season. The food consists of worms and insects. The flight is smooth and rapid, though low. The male has a soft sweet song, for the sake of which it is kept in aviaries. The wheatear is much esteemed for the table both in this country and on the Continent. Great numbers are captured on the South Downs of England before the autumn migration by the shepherds, by means of a simple trap, consisting of a covered passage cut in the turf, within which is a small stick supporting two horse-hair nooses.

**WHEAT-FLY or WHEAT-MIDGE** (*Cecidomyia tritici*) is a dipterous insect belonging to the genus *CECIDOMYIA*, well known for the damage which it does to growing wheat. The perfect insect is about one-tenth of an inch in length, of a yellow or orange colour, with whitish wings, large black eyes, and long slender legs. It appears in June, and the female, by means of her long ovipositor, deposits her eggs into the heart of the flower of the wheat, sometimes to the number of twenty together. The eggs hatch in about eight or ten days into small footless grubs, which grow to a length of one-eighth of an inch. They are yellowish in colour, with a pointed head and truncated tail, and have a quick wriggling motion. They feed on the central organs of the flower, rendering it abortive. An allied species, the HESIAN FLY (*Cecidomyia destructor*), which commits great ravages on wheat and barley in America, was first discovered in Britain in July, 1886, having been introduced, probably in the pupa state, in straw used for packing or for litter. Fortunately some of the parasitic Hymenoptera, which help to keep it in check in America, have accompanied it across the Atlantic; and great efforts have been made to stamp out this pest before its ravages become serious. Another species of wheat-fly is *Chlorops tanipus*, also called corn-fly, a fly of the family Muscidae. It deposits its eggs between the leaves of the young wheat, and the larvæ by feeding on the juices produce the disease called gout, from the swelling of the joint. A species of Aphis, the Corn or Wheat Aphis (*Aphis granaria*), is sometimes injurious to wheat, appearing in great numbers on the ears. A species of THRIPS (*Thrips cerealium*) is injurious to late-sown wheat, causing the grain to shrivel. The Corn Sawfly (*Cephus pygmaeus*) sometimes does great mischief to wheat, the eggs being deposited in the stem. [See SAW-FLY.] The CORN-WEEVIL (*Calandra granaria*) and the Wheat or Corn Moth (*Tinea granella*) confine their ravages to the stored wheat.

**WHEATSTONE, SIR CHARLES**, one of the most distinguished inventors of this or any age, was born at Gloucester in 1802. From his early youth he evinced great delight and remarkable ingenuity in mechanical contrivances of every kind, especially in the domain of optics and the transmission of sound. His contributions to the *Transactions of the Royal Society*, dating from the year 1825, are found under thirty-one headings of the catalogue, and they range from experiments on gyroscopes to others with captive balloons. He devised a new method of determining apparent solar time by the diurnal changes of the plane of polarization of light, and he treated of the optical effect of the juxtaposition of colours. In the wide sphere of physical science he fully merited the well-known eulogium of Johnson's epitaph upon Goldsmith, for there were few subjects which he did not touch, and he touched none which he did not adorn. Of all Sir Charles Wheatstone's numerous inventions, probably those which are best known and of most practical value are the stereoscope and the successive discoveries by which the electric telegraph was brought to its present perfection. The stereoscope, now so popular in the illustration of photography, &c., was pronounced by Sir David Brewster as the greatest discovery ever made in binocular vision. From 1836 to 1875, Wheatstone constantly laboured to perfect some branch of electrical science, and the history of his inven-



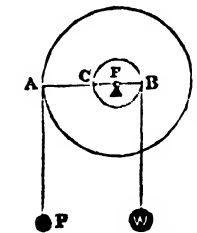
tions would be the history of telegraphy, which, under the heading TELEGRAPHY, we have already traced. His five-needle telegraph was produced in 1837, the alphabetical telegraph in 1840, the type-printing telegraph in 1841, the improved magnetic dial telegraph between 1858 and 1867. In the latter the electric contacts were made and broken by a paper ribbon, previously perforated with holes in the proper places; and in this way a speed of transmission of from 100 to 160 words per minute was attained, and the feats of modern communication rendered possible.

In 1840 Mr. Wheatstone conceived the idea of a submarine telegraph cable, and under his guidance all difficulties were removed, and instant communication with the most distant parts of the world rendered practicable. It was while on a visit to Paris to explain to his colleagues of the French Academy a new recording instrument for submarine cables, that Sir Charles was overtaken with an attack of bronchitis, to which he succumbed, 19th October, 1875. In his scientific labours, which, perhaps, have never been equalled in their extent, their variety, and their fruitfulness, Sir Charles Wheatstone was from an early period assisted by Sir W. F. Cooke; and it was chiefly by the energy and business management of the latter that the inventions of Sir Charles were brought to public notice and into such general utility. Professor Wheatstone received the honour of knighthood in 1868, which was also conferred on his colleague, Mr. Cooke. Sir Charles also received from time to time a large number of honours, distinctions, and diplomas, conferred by various universities, governments, and learned societies.

**WHEEL AND AXLE, THE**, is an extended application of the pulley, and in the simplest idea of it, it may be described as two pulleys of different diameters fixed together, and having the same centre, of which the larger is the wheel and the smaller the axle. In this it is obvious, that a certain force applied at the rim of the larger, will balance some greater force at the rim of the smaller one, in which fact consists the advantage of the machine.

In the annexed figure, suppose  $AB$  and  $CB$  to be two pulleys of 3 feet and 1 foot diameter respectively, fixed together, and hung on the same centre,  $F$ , and suppose a weight,  $w$ , suspended at the circumference of the small pulley,  $CB$ , and a weight,  $r$ , at that of the large one,  $AB$ ;

then draw the line  $AFB$  horizontally across the centre; the cords by which  $r$  and  $w$  are suspended will just leave the pulleys at the points  $A$ ,  $B$ , so that the weight  $r$  acts at the distance  $AF$  from the centre, and  $w$  at the distance  $BF$ . It is, moreover, easy to see, that though the lines  $AF$  and  $BF$  lie in different planes, the mutual effect of the forces,  $r$  and  $w$ , acting through them is just



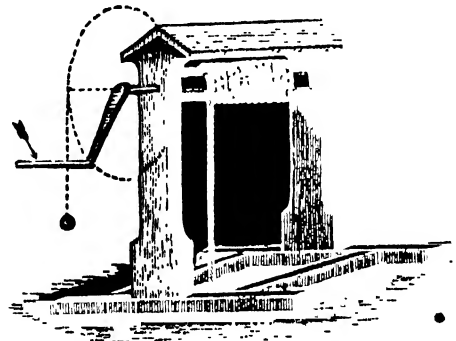
the same as if  $AF$  and  $BF$  lay in the same pulley; so that the line  $AFB$  is to all purposes a lever sustained on the fulcrum,  $F$ , and the same conditions of equilibrium apply to the machine. If, therefore, the weights,  $r$  and  $w$ , balance each other on the pulleys, the products had by multiplying these weights by their distances respectively from the centre,  $F$ , must be equal; consequently, if  $w$  be 90 lbs. and  $BF$  6 inches, then  $90 \times 6 = 540$  is the moment of the weight, and we require only to divide 540 by the distance,  $AF$ , to ascertain the power,  $r$ . The wheel being 3 feet,  $AF$  is 18 inches, and  $540 \div 18 = 30$ , so that a power of 30 lbs. acting at  $A$  is sufficient to balance 90 lbs. acting at  $B$ .

The power bears the same proportion to the weight that the distance of the weight from the centre has to the

distance of the power from the same point; or, as it is more shortly expressed, the power and the weight are to each other, inversely, as their distances from the centre, which is, indeed, another expression of the law of equality of moments as applied to the lever.

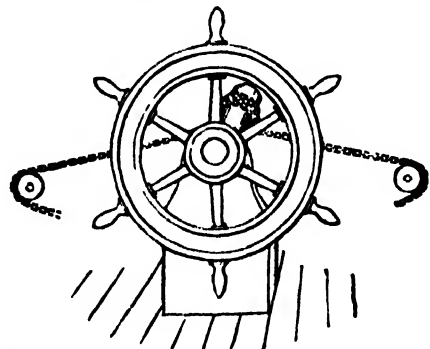
Now, though the practical use of this machine is the same as that of the other combinations of pulleys—namely, to move weight or resistance of any kind through considerable space, yet the ropes are differently arranged; for whereas in the former cases they do not terminate in the pulleys, in this case they do so. There must, therefore, be provision on each pulley for a length of rope sufficient for the purpose of being coiled round it, which is simply attained by making the pulley of a proper depth. In regard to the wheel—as the power is usually applied by other means, the rope is dispensed with, and, in place of the wheel, one or more levers are employed, or in some cases, a toothed wheel and pinion.

A simple and common application of the wheel and axle is made at the mouths of draw-wells for raising the water in buckets. In the annexed sketch the “axle,” or more



properly the barrel, is supported between two cheeks, and round it the rope is coiled, at the end of which a bucket of water hangs, which is the weight to be raised. On the extremity of the axle a cranked handle is fixed, which, when in motion, describes a circle, and this represents the “wheel,” the force being applied as indicated by the arrow.

The capstan and the crab or winch are other examples of the wheel and axle. The mechanism employed to man-age the helm of a ship is a true wheel and axle. In this



case the arms of the wheel are projected through the rim, forming handles, by which the wheel is turned. The chain is wrapped a number of times round the axle and led off on both sides round pulleys, to a lever upon the helm, to which it is attached.

**WHEEL-ANIMALCULES.** See ROTIFERA.



**WHEEL'ING**, a city of the United States, the capital of West Virginia. It is a port of entry, finely situated on the east bank of the Ohio, and on both sides of Wheeling Creek, 92 miles below Pittsburg and 351 miles northwest of Richmond. The city stands on a narrow tract of land, extending about 2 miles along the river, and overlooked by precipitous heights, so that any future extension of it must be made on the banks, as no more building can take place at the back. The streets cross each other at right angles, and are well paved. Wheeling is the most important place on the Ohio River between Pittsburg and Cincinnati, and is fast increasing in respect to trade, manufactures, and population. It contains a fine court-house, a custom-house, numerous churches, academies, banks and a fine opera-house. The town is supplied with water raised from the river by machinery. The National Road crosses the river at Zane's Island, opposite the city, by a beautiful wire suspension bridge, the span of which measures 1010 feet. It is supported by four wire cables, each 1380 feet in length and 8 inches in diameter. Wheeling is the western terminus of the Baltimore and Ohio Railway, 380 miles long, and of the Hempfield Line, which joins that of Pennsylvania at Greensburg; 4 miles south is the east terminus of the Central Ohio Railway. The Cleveland and Pittsburg Line also passes through the town. The hills which rise in the immediate vicinity contain inexhaustible beds of coal, which supply fuel at a small expense to the numerous manufactories. There are iron-foundries, forges, manufactories of nails, glass, cotton goods, paper, steam engines, and silk goods. Flour, woollen fabrics, white lead, leather, and other articles are also produced, and shipbuilding is carried on somewhat extensively. The population in 1880 was 31,266.

**WHEEL-WINDOW.** See ROSE-WINDOW.

**WHELK** (*Buccinum*) is a genus of molluscs belonging to the order GASTROPODA, family Buccinidae. The shell is ovate and ventricose, with few whorls, a large aperture, and the canal very short and reflected: the operculum is ovate and horny. The animal has a broad head with a large proboscis, a long linear lingual ribbon or tongue with two rows of teeth, and two eyes on stalks. The whelk is carnivorous and preys on other molluscs by drilling holes in their shells with its proboscis. There are about twenty species, chiefly found on the coasts of the northern seas, from low water to 140 fathoms. Whelks are caught both for food and for bait. They are taken by dredging nets, and also, in some places, by letting down crabs threaded together, or baskets baited with pieces of fish. Great quantities are consumed as food, chiefly by the poorer classes, being boiled and eaten with a little vinegar and pepper. The yellow egg-cases are aggregated in rounded masses, and when thrown ashore attached to other shells resemble corallines. The Common Whelk (*Buccinum undatum*) is found on all the coasts of Britain, and is abundant throughout the northern hemisphere. The shell varies considerably in shape and colour, and is from 3 to 6 inches long. The Dog-Whelk (*Nassa reticularia*) is common on British coasts at low water. It has a similar but much smaller shell, and a broad foot with diverging horns in front, and two little tails behind. It is also very carnivorous, destroying numbers of other molluscs.

**WHEERY**, a boat much employed in river navigation, which has its bow and stern nearly alike, and both shaped at a very large angle with the keel. It is a very large craft, built for swiftness, and can be rowed by a pair of sculls.

**WHEE'STONE**, a very fine-grained silicious (or flinty) stone adapted for sharpening steel blades.

**WHEW'ELL, WILLIAM, D.D.**, an eminent man of science, scholar, and philosopher, was born at Lancaster in 1795. He studied with high distinction at the University of Cambridge, where he became a fellow of Trinity College.

In 1828 he was appointed professor of mineralogy; in 1838 professor of moral philosophy; and in 1855 he held the office of vice-chancellor of the university. In 1841 he became master of Trinity College. He was a fellow of the Royal Society and of many other learned bodies. His writings are very numerous and various. Among them are comprised elementary treatises on mechanics for the use of students, specially remarkable for the clear, precise, and philosophical manner in which the first principles of mechanics are explained. These were followed by a treatise on the "Mechanics of Engineering," published in 1841—a work of small bulk but of great importance, as having originated much of what has been since done in the way of applying mechanical science to practical purposes. In 1833 his "Astronomy and Physics, considered with reference to Natural Theology," was published as one of the Bridgewater Treatises. Between 1837 and 1861 appeared what is perhaps Dr. Whewell's greatest work—a series of treatises embracing a most comprehensive and clearly-arranged narrative of the progress of those branches of knowledge which are arrived at by induction. The first of those treatises was entitled "The History of the Inductive Sciences," and was followed by "The History of Scientific Ideas," "The Philosophy of Discovery," and "The Novum Organum Renovatum." The "Elements of Morality," and other treatises, contain the doctrines taught by the author as professor of moral philosophy. His long and elaborate series of researches on the tides appeared in the *Philosophical Transactions*. His death, the result of a fall from his horse, occurred on the 6th of March, 1866.

**WHEY** (Anglo-Sax. *hwáy*), the limpid part of milk left after the separation of the acid butter, and containing between 3 and 4 per cent. of sugar of milk in solution.

**WHIFF** (*Rhombus megastoma*) is a species of flat-fish, belonging to the same genus as the TURBOT. The whiff is found on the coasts of northern Europe and Britain, extending into the Mediterranean. It is about 21 inches long, and weighs from 3 to 4 lbs. In calm weather it rises to the surface, and, raising its tail out of the water like a sail, drifts towards the shore; from this habit it is often called the sail-fluke. Another name given to it on our southern coasts is the Mary-sole, which is by some considered a distinct species. It is highly esteemed for the table, but it is rarely taken.

**WHIG.** Different accounts are given of the origin of this word. The most probable, as given by Bishop Burnet, refers it to the Scotch Covenanters, called *Whiggamores*; though Defoe says that it was derived from a mixed drink of sour milk and water which they drank during their wanderings. It was adopted as a distinctive party name by the politicians who placed William III. on the English throne, and is still in vogue as applicable to the aristocratic or least progressive section of the Liberal party.

**WHIM'BREL** (*Numenius phaeopus*) is a bird belonging to the family Scolopacidae, and to the same genus as the CURLEW, which it resembles nearly in appearance and habits. It is widely distributed in Europe, Asia, as far south as India and Ceylon, and Africa, to Cape Colony. In Britain it occurs chiefly on migration in spring and autumn, but breeds in the Orkney and Shetland Islands. The female is larger than the male, measuring 18 inches in length, with the bill about 3½ inches long; the male measures 2 inches less, and its bill about 3 inches. The plumage is of a bright ash colour above, with the belly and abdomen white, and brown spots on the neck and breast. The nest is made on wild heaths and moors, and contains four eggs, which are regarded as delicacies. The whimbrel was formerly highly esteemed for the table.

**WHIN** or **WHIN'STONE** is a Northern English and Southern Scotch term for igneous rocks of the character

of basalt and greenstone. It is, however, occasionally applied by the miners, both of Northumberland and South Wales, to hard gray sandstone. In the lead-mining districts of Northumberland, the various beds of basalt are named "sills," and upon the edge of the most prominent of these—the "Great Whin Sill"—the Roman wall is built for a long distance.

**WHIN.** See **FURZE**.

**WHINCHAT** or **FURZECHAT** (*Saxicola rubetra*), a British bird belonging to the family SYLVIIDÆ, and to the same genus as the **STONECHAT** and **WHEATEAR**. It is a summer visitor to Britain, occurring very generally throughout our islands, but is nowhere abundant. It is widely distributed throughout Europe, wintering in the countries bordering the Mediterranean. The whinchat is scarcely 5 inches in length. In the male the general colour of the plumage is blackish-brown, with a spot of white on the wings and tail, the neck and breast rusty; the throat, a streak on each side of the neck, and an elongated streak above the eyes white. The female has the white parts of the male replaced by yellowish-white, and the lower parts rusty-white.

The flight of the whinchat is undulating, and it flits from bush to bush, perching on one of the topmost twigs. Furze commons are its favourite haunts, whence it derives its popular names, but it also frequents inclosed fields and meadows. Worms, insects, small molluscs, and slugs form its principal food, but it also eats berries. The nest resembles that of the stonechat, and is formed of dry grass stalks and a little moss, the lining being finer bent or stalks. It is usually placed on the ground. The eggs are five or six in number, bluish-green, closely mottled with pale reddish-brown. There are generally two broods, the first appearing towards the end of May. The song is very pleasing, and somewhat resembles that of the goldfinch. Whinchats become, like the wheatear, very fat in August, and, though smaller, are equally delicate for the table.

**WHIP** or **WHIPPER-IN**, a name (derived from the Hunting-field) which, in parliamentary practice, is applied to certain members chosen by each of the great parties represented in the House of Commons to enforce discipline, secure the attendance of members on all necessary occasions, and to arrange beforehand the order of speakers. A summons to attend a division is also termed a "whip," and the importance of the occasion is signified by the underlining of the message, four lines being the maximum number, reserved for divisions of the greatest importance.

**WHIP-POOR-WILL** (*Antrostomus vociferus*) is an American bird belonging to the family CAPRIMULGIDÆ (**GOATSUCKERS**), so called from its singular note. The whip-poor-will is found in most parts of the United States, where, however, it is a bird of passage, usually arriving from the south towards the end of April, and departing for its winter abode about the beginning of September. It measures 10 inches in length, and exhibits in its plumage a mixture of black, pale cream colour, brown and rusty red, with numerous sprinkled and powdered minute streaks and spots. The tail, which is rounded, has the three outer feathers on each side blackish-brown for half their length, and the remainder, to the tips, pure white; the four middle feathers are marked with herring-bone lines of black and yellow. The whip-poor-will usually resorts to elevated and dry situations, and is rarely seen or heard in low marshy districts. It is nocturnal in its habits, sitting close during the day in the most retired and shady spots to be found in the woods, or on the steep bushy banks of a creek or river. When disturbed in the daytime it sails slowly through the wood to a short distance, and then settles generally on a low branch of a tree. At dusk these birds issue from their concealment and hawk about in the manner of the common goatsucker in pursuit of night-flying insects; they also feed upon grasshoppers, ants, &c. Their note, which is emitted in the evening and night, especially during the

breeding season, is described as distinctly resembling the syllables *whip-poor-will*, the first and last syllables being uttered with great emphasis, and the whole occupying about a second in its emission. Among the Indians this bird, from its nocturnal and noiseless activity and its singular note, became the object of some superstitious dread, in this respect sharing the evil repute of the owl. The female begins to lay about the second week in May, and takes no trouble in preparing a nest, but deposits her eggs, which are two in number, greenish-white with spots and blotches of bluish-gray and light brown, either on the bare ground or on a few dry leaves. A nearly allied species is the **CHUCK-WILL'S-WIDOW** (*Antrostomus carolinensis*).

**WHIP-TOM-KELLY.** See **GREENLET**.

**WHIRLPOOL**, a circular current in a river or a sea, caused by the meeting of opposing currents. Thus the famous **MAELSTROM** is caused by the north-west wind, very fierce and prevalent there, catching at a quick angle a swift tide either flowing or ebbing, and therefore setting up a strong rotatory current which if the wind blows a gale will founder large ships. If the wind is not blowing, or the tide is at the turn, the Maelstrom is not in the least dangerous, for no whirlpool exists.

**WHIRLWIND**, a circular current of wind, caused by two opposing winds, and rotating in the direction of the stronger. Whirlwinds rapidly originate in tropical countries, and frequently pass away as quickly as they arise, their cause being the inequality of the heat given out to the air by various portions of the earth's surface, and the consequent variation of the currents of air produced. This is most frequent of all in arid sandy plains, and the rapidly ascending currents, if they meet and clash, form whirlwinds, which suck up clouds of dust and carry them along for some distance. It is this phenomenon on a large scale which causes the terror of the dreaded *simoon*. [See **SIMOON**.] When whirlwinds occur at sea they cause **WATERSPOUTS**.

**WHISKY** (from the Gaelic *uisge*, water, *usquebaugh* water of life) is properly made from malted barley, but by distillation it may be obtained from almost any variety of grain, as well as from potatoes, and even from turnips. In America it is often made from rye, and inferior qualities from oats, rice, mullet, buckwheat, &c. Scotland, Ireland, and the United States of America are almost the only whisky-producing countries, the best being made north of the Tweed. The manufacture is very similar to that of other spirits, described in the article **DISTILLATION**. Whisky, and in fact all spirits, being regarded more as luxuries than otherwise, they are subject to very high duties; and as the higher the duty the greater the temptation to smuggling and evasion, distilleries are subject to most stringent oversight by the officers of excise, who exercise a supervision on the premises day and night, Sunday and week-day, and who are vested with an authority in many respects superior even to that of the proprietor himself. Apart from their being articles of luxury, the legislature has another idea in imposing a heavy tax upon spirits—namely, that of checking the consumption, as the most pernicious effects arise from their excessive use. It was with this avowed object that, early in the last century, the government laid the enormous duty of 20s. per gallon on these spirits, besides heavily taxing the retail dealers. The expedient, however, failed, for the trade then became unprofitable, and fell into the hands of the most unscrupulous and even criminal classes, who began smuggling on the largest scale; to such an extent, indeed, and with such violence, that the revenue officers found it impossible to prevent it, and the Act having thus become a dead letter, it was repealed in 1742, and a lower duty substituted. In Ireland the repressive system was still continued, but its total failure was seen in the fact that in one year, when the consumption was 10,000,000 gallons, duty

was paid on 3,000,000 only. Illicit distillation abounded, the most daring assaults were made upon the excisemen, whose lives became unsafe; and, as the common people invariably sided with the smugglers, the country became almost in a state of rebellion. This led to the adoption, in 1823, of a much lower duty in Ireland and Scotland than in England, which difference existed (though the amount varied) till 1858, when the duty was equalized throughout the United Kingdom, being then made a uniform rate of 8s. per gallon. In 1860 it was raised to 10s. by Mr. Gladstone; the chief object was to diminish the consumption, which, however, has not been attained. Owing, perhaps, to the improved morals of society, as well as to the vigilance of the officers, illicit distillation and smuggling are declining; but the high duty seems to have increased the temptation to produce a greatly adulterated and very injurious article, which may be sold at a cheaper rate than the market price of the genuine spirit will allow. Much of the Scotch and Irish whisky is purchased by English rectifiers for conversion into British gin; it is also to some extent sent to France, to be returned as brandy.

The quantity of whisky on which duty is paid in Scotland is rather over 8,000,000 gallons per annum, and in Ireland nearly 7,000,000 gallons.

The manufacture of whisky similar in process to that pursued in the United Kingdom is largely carried on in New York, Pennsylvania, Ohio, Illinois, Indiana, Kentucky, and other parts of the United States of America. The value of the quantity annually consumed in that country alone is nearly £6,000,000.

**WHISPERING** is speech without true vocal sound, and is produced by the vocal cords being kept close and motionless, the air, whose wind-rush produces the sound of the whisper, passing through a small triangular opening at the back part of the glottis between the arytenoid cartilages. If the lips are set for the vowel *u* the whisper passes towards a whistle.

**WHITBY** (i.e. the "White dwelling"), a market-town and seaport of England, in the North Riding of Yorkshire, 51½ miles from York and 217½ miles from London by rail, is situated near the shore of the North Sea, on both banks of the Esk, which here flows through a narrow valley between lofty and steep cliffs. The environs are extremely romantic, and the town is growing in favour as a seaside resort. The river divides the town into two nearly equal parts—that on the north-west bank being somewhat the larger and the better built; that on the south-east the more ancient, with many of the houses rising above each other among the cliffs. The parish church, which formerly belonged to Whitby Abbey, stands on the summit of the south-east cliff, and the ascent to it is by 194 stone steps. It contains some Norman portions. Adjoining are a few scattered remains of the once celebrated abbey, which was founded as a nunnery about 657 by Hilda, a Northumbrian princess, and re-established after the Conquest by William de Perei, for Benedictine monks. There are several other churches in the town, a Catholic chapel, several dissenting chapels, a museum and library, some good hotels, a grammar school, dispensary, public baths, and various charities. The harbour is in the river, is provided with quays, and defended by two stone piers. The western one extends into the sea in a north-eastern direction 2000 feet, with a lighthouse at its further end. The eastern projects across the entrance of the harbour, so as to defend it from the violence of the waves. A bar at the mouth prevents large vessels from entering. Coals and alum are exported, and large quantities of articles worked in the jet found near the town, and for the manufacture of which Whitby is famous. Iron shipbuilding is largely carried on, but the whaler industry has entirely died out. Dr. Scoresby, celebrated as an Arctic explorer,

was a native of Whitby. The population of the town in 1881 was 14,086. The parliamentary representation ceased under the Act of 1885. The more ancient name of Whitby—Streonsshall—is locally pronounced "Strens-hawl."

**WHITBY, SYNOD OF** (A.D. 664). See **SYNOD OF WHITBY**.

**WHITE CORPUSCLES**. See **BLOOD**.

**WHITE ELEPHANT**. See **ELPHANT**.

**WHITE FRIARS**, the Carmelite monks, so called from the colour of their robes; the black friars being the Dominicans. The district of London known as Whitefriars takes its name from a Carmelite monastery which formerly stood there.

**WHITE, GILBERT**, the naturalist, was born in 1720 at Selborne in Hampshire, a pleasant and sequestered village on the eastern skirts of Woolmer Forest, to which his father, a barrister of the Inner Temple, had retired in 1731. In 1739 he was admitted a student of Oriel College, Oxford, and was elected a fellow of his college in 1741. He entered the ministry, and was curate of Faringdon from 1755 to 1784, when he became curate of Selborne. He died, unmarried, in 1793. He spent all his leisure in exploring the fauna and flora of his neighbourhood, in watching attentively the ways and habits of its animated nature, in diarizing the weather and other natural phenomena, and in corresponding on and studying natural history. In 1789 appeared his ever-famous "Natural History and Antiquities of Selborne, in a series of letters to the Hon. Daines Barrington and Thomas Pennant, Esq.," one of the most delightful books ever penned. It forms part of the *Camelot* classics (1887), and can therefore be purchased in that excellent form for a few pence. In 1795 Dr. Aikin compiled from White's notebooks his "Naturalist's Calendar," a valuable series of observations.

**WHITE, HENRY KIRKE**, the poet, was born at Nottingham on 21st March, 1785. He was the son of a butcher, helped in his father's trade, worked at a stocking loom, and in a lawyer's office successively. Yet he made himself able to contribute to local newspapers, and to write poetry. In 1803, encouraged by Hill and Capel Loft, he published his first volume of poems; but the volume was coldly received. Southey, however, took some kindly notice of the young aspirant, and gave him good advice. At this time he devoted himself to study so resolutely as to sow the seeds of disease in his constitution. His long-cherished desire to enter the university was at length gratified, through the patronage of Mr. Simcoe, and he became a sizar in St. John's in October, 1804. His industry was incessant; he carried the first place in every examination. But his constitution was undermined, and he sank to delirium, stupor, and death. He died 19th October, 1806. His literary "Remains" were published by Southey, and have long been popular. His muse was quiet and pensive, reposing on the beauty of nature, and sanctified by the power of a living faith. He was of a most amiable character; and though he was ambitious, his aims were noble.

**WHITE, JOSEPH BLANCO**, or, as he was called in Spain, *Don Jose Maria Blanco y Crespo*, was born at Seville, 11th July, 1775. His grandfather, who had emigrated to Spain in the beginning of last century, was a descendant of an Irish Roman Catholic family. In 1799 he entered priest's orders, and was chosen rector of his college. After several vicissitudes occasioned by the French invasion, he in 1810 arrived in England, and immediately started *El Espanol*, a monthly periodical in Spanish, which continued to be issued for above five years. When it failed in 1814, the government gave him a pension of £250. He now obtained orders in the Church of England. But he soon dropped all idea and intention of being an episcopalian minister. In 1820 he began a series of papers

in the *New Monthly Magazine*, entitled "Letters from Spain, by Don Leucadion Doblado," which in 1822 were gathered into a separate volume. In this year he started a second Spanish periodical, *Las Variedades*. His books against popery were very popular, such as his "Practical and Internal Evidence against Catholicism" in 1825; "The Poor Man's Preservative against Popery;" "Second Travels of an Irish Gentleman in Search of Religion," a reply to Moore's famous work with a similar title. He also edited the *London Review* for the six months of its duration, and was a frequent contributor to the monthly and quarterly periodicals. After many reasonings and doubts he, in 1835, publicly avowed himself a Unitarian. But he seems to have gradually passed into a rationalism which left very few articles in his creed. His last years were spent in Liverpool amid much weakness and disease, and he died on the 20th May, 1841. Blanco White is secure of immortality for one piece, one of the finest sonnets in the English language, a parallel between night and death, a work of consummate genius, beginning—

"Mysterious Night! when our first parent knew  
Thine from report divine, and heard thy name."

Blanco White's most interesting autobiography was published in 1845. He has endeavoured quite honestly to trace his career in search of a faith and his final home in Unitarianism.

**WHITE LEAD**, a basic carbonate of lead ground into a paint with linseed oil, and much employed as a white paint, and as a base for other colours in painting. See **LEAD**.

**WHITE LEG** or **PHLEGMASIA DOLENS** is the name of a disease generally confined to the puerperal state, but which may affect both sexes at any period of life. As affecting lying-in women, it generally commences in the second or third week after delivery, and its advent is preceded by a feeling of depression and general uneasiness, followed by slight feverishness, which may last for a day or two. These symptoms are followed by pain and tenderness in the groin, which gradually extend over the whole limb, the pain often being very severe. Simultaneously with the feeling of pain, or within a day or two after it, swelling appears, which gradually spreads and increases in hardness until the limb may become double its normal size. When the swelling commences, and again as it disappears, it may be soft and liable to pit on pressure, but during its full development it is hard and elastic, and resists pressure. While the swelling is at its height the limb presents a peculiar appearance, as in addition to its abnormal size it is pale or sallow in colour, like a dead limb, the skin being glossy, as if greased over, whence the disease is sometimes called "marble leg." With the progress of the swelling the pain is greatly diminished, but after its development the limb lies useless, and cannot be moved without causing much suffering. After the disease has lasted nine days or thereabouts it generally begins to recede, but even in a favourable case several weeks may elapse before recovery is effected. The malady rarely, if ever, proves fatal, and when uncomplicated a favourable termination may usually be anticipated. The treatment of this disease must be both constitutional and local. The former must be varied according to the special circumstances of the case, and no fixed rule can be laid down. Local treatment consists in giving the limb rest either in a flexed or extended position, as may prove most comfortable, and in the use of hot fomentations several times daily. The fomentations are sometimes made more effective in the alleviation of pain by the use of decoctions of poppy-heads, or of infusions of camomile flowers. Sometimes warm bran poultices may be applied with advantage to the whole length of the limb, but they are hardly so effective as oft-repeated fomentations. After the active disease has disappeared, friction, bandaging, faradisation, and the use of

mercurial and belladonna ointments may be required to remove the aching, swelling, weakness, hardness, &c., which may be left behind.

**WHITE MOUNTAINS**, a detached group of the Alleghany or Appalachian Mountains, U.S., in the north central part of New Hampshire. The highest summit is Mount Washington, 6288 feet, ascended by a railway to a hotel at the top, and there are several others nearly 6000 feet. They present the finest mountain scenery in the east states, there being much wild grandeur among the higher peaks, and picturesque beauty on the shores of the lakes. The mass of the mountains is granite, covered with a stratum of mica slate.

**WHITE SEA**, a large gulf of the Arctic Ocean, which enters deeply into the northern parts of European Russia, between 64° 30' and 68° 30' N. lat. The entrance is between Kanin Noss, on the island of Kaninskaja Zemlia, which lies to the east, and Svatoi Noss, a projecting cape of the peninsula of Kola, on the west. These two places are about 100 miles distant from each other. The gulf penetrates into the land 350 miles in a south-east direction, gradually becoming narrower, until part of it turns to the north-west and forms the Gulf of Kandalak, where it is hardly more than 40 miles wide. That portion which proceeds to the south and south-east is much broader, and expands into the two large gulfs of Archangel or the Dwina and that of Onega, named respectively from the rivers that fall into their most south-eastern recesses. The area of this sea is about 37,000 square miles, and the length of its coast-line about 1000 miles. It is so far favourable to navigation that it has a considerable depth of water, with the exception of a sandbank which lies before the mouth of the Dwina. It is frequently covered with fogs, which are thick at a distance from the shore, but much less so as the coast is approached. The navigation, however, is restricted to about six months of the year, in consequence of the ice, which is sometimes found even at a distance of 30 miles from the shore. It is at this time that the sea answers its name, as the ice is nearly always covered with a hard incrustation of snow. There are several inhabited islands in different parts. The important harbour of Archangel is near the mouth of the Dwina. Seals, herrings, and cod-fish are very frequently met with on the shores. The white whale, which yields a valuable oil, is found in large shoals. The passage was discovered by Richard Chancellor in 1553.

**WHITE SWELLING**, the popular name for a chronic inflammation of the joints, occurring in scrofulous subjects. The complaint appears sometimes to originate in a slight injury, but often no cause can be assigned for its occurrence. The joint slowly becomes stiff and swollen; for a long time it is painful only on being moved. The swelling is caused largely by the parts exterior to the joint becoming thickened and infiltrated with plastic and fatty matters. It comes on very slowly, and as it supervenes the prominences of the bones are lost, and the joint becomes rounded, and has a doughy or semi-elastic feel. The appearance of the skin, which for a long time preserves its natural colour, gives the disease its popular name. The swelling, considerable in itself, seems greater from the wasting of the rest of the limb. The disease has a great tendency to run on to suppuration, which takes place both within and around the joint. This is rapidly followed by hectic fever, and often by chest trouble, leading on to consumption. Treatment consists in attention to the general health, with generous diet and the use of such remedies as iron, cod-liver oil, Parrish's chemical food, iodine, &c., supplemented by the use of splints or the starch bandage to keep the joint in a state of rest. When the inflammation has entirely subsided, friction and stimulating liniments may be employed to restore motion to the joint. In some cases surgical measures have to be resorted to.

**WHITE VITRIOL** (sulphate of zinc). See **ZINC**.

**WHITE BAIT.** In the last volume of the "Catalogue of Fishes in the British Museum," Dr. Gunther describes the whitebait as a purely nominal species, introduced into science in deference to the opinion of fishermen and gourmands, and states that he had gone very thoroughly into the matter, and every example of whitebait examined by him were young herrings. The late Mr. Yarrell, who was followed by most naturalists, regarded whitebait as a distinct fish; but the circumstances that it has the same number of vertebrae (56) as the mature herring, the same number of lateral scales, and an identical arrangement of fins and teeth, a combination of characters found in no other fish, prove conclusively that it is the fry or young of the herring; moreover, an adult whitebait in roe has never been discovered.

About the end of March or early in April whitebait begin to appear in the Thames. The fishing season begins in June and continues till September. During these months immense quantities are consumed by visitors to Greenwich, Blackwall, &c. The close of the parliamentary session is usually indicated by a "whitebait dinner," in which all the leading members of the government participate. Whitebait are caught in bag-nets with very small meshes.

**WHITEFIELD, GEORGE**, an English clergyman, and founder of one of the two great divisions of Methodism, was the son of an innkeeper, and was born in Gloucester, 16th December, 1711. He was educated at the grammar-school of St. Mary de Crypt in his native town, and was admitted a servitor of Pembroke College, Oxford, in 1733. There he became intimate with John and Charles Wesley, and a zealous member of the club in which the denomination of Methodists took its rise. At the college, Whitefield's enthusiastic temperament led him to adopt extreme habits of asceticism, devotion, and charity, and he was compelled by failing health to return to Gloucester, where he was ordained deacon by Bishop Benson, in June, 1736. He preached the following Sunday in Gloucester Cathedral with such extraordinary effect upon his congregation, that complaint was made to the bishop that he had driven fifteen persons mad. The same year he took his degree of B.A., and in 1737 he went to London to preach at the Tower Chapel, where he attracted large congregations, and exercised a remarkable influence upon them. He afterwards filled for a few months a curacy in Hampshire, and in December, 1737, he was induced by the letters he had received from John Wesley, then in Georgia, to start for that colony. While in Georgia he formed a plan for the formation of an orphan asylum there, and in September, 1738, he returned to England to obtain funds for such an institution, and to receive priestly orders. On reaching England he found Wesley busy with the work of the Methodist revival, and after receiving ordination from Dr. Benson he entered in earnest upon the missionary labours from which the origin of Methodism is dated. In February, 1739, being refused admission to the pulpits of Bristol, he commenced at Kingswood the series of open-air services which soon became a distinctive feature of the new movement. From this time he travelled continuously, preaching everywhere to enormous crowds, with marvellous results. In 1739 he went back to his orphan house in Georgia, afterwards visiting New England, and remaining away from the old country for nearly two years. In 1741, after he had returned, he became engaged in a controversy with Wesley on the subject of Calvinism, and though the two leaders always remained upon terms of friendship, from this period they took separate courses in their evangelical labours. In 1744 he made a third voyage to America, where he continued his preaching tours with a success equal to that he had experienced in England, and after a visit to the Bermudas for his health, he returned to England. After successful tours in Ireland and Scotland he was again in Georgia and South Carolina in 1751-52, and in 1754

made a fifth voyage there, accompanied by a number of children for his orphan house. His tour extended from Georgia to New Hampshire, and he was afterwards accustomed to speak of it as the most important of all his expeditions. He returned to London in May, 1755, and soon after again visited Scotland and Ireland. In Dublin he was assaulted by a mob and severely wounded with stones, but in Scotland he made the acquaintance of the Countess of Huntingdon [see HUNTINGDON, LADY], who made him her chaplain, greatly assisted him in the founding of his societies, and introduced him to the highest circles of rank and literature in London. He made his sixth American tour in 1763-65, and was in England from 1765-69, and during this, his last sojourn in England, he did much towards establishing Calvinistic Methodism in England, by consecrating the chapels built by the Countess of Huntingdon, and assisting in the work connected with her training college at Trevecca. In 1769 he started on his seventh and last American tour, for by this time his health, worn out by his incessant labours, was giving way, and he died at Newburyport from asthma, 30th September, 1770. He had preached for two hours at Exeter, N. H., the day before his death, and had afterwards addressed the crowd that came to meet him at Newburyport in the evening.

Whitefield married in 1741 a widow lady, who bore him a son who died in infancy. Like Wesley his married life was unhappy, and when in 1768 his wife died, the event, according to his friend and biographer, "set his mind much at rest." Whitefield was tall in person; his features were regular, and his eyes small, blue, and luminous, one of them having a slight cast. His voice was marvellously rich, sweet, and sonorous. As a preacher he possessed a power over his audiences which was simply marvellous. Among the poor and uneducated his preaching produced curious physical manifestations and intense excitement, while among the higher classes it attracted the admiration of such men as Chesterfield, Bolingbroke, Hume, and in America Benjamin Franklin. The influence certainly did not arise from his intellectual power, theological learning, or beauty of style, for in these respects he stands lower than many of the preachers of his day, but no other man possessed in equal power his spell over an audience. His published sermons seem simple and meagre productions, but when delivered, the intense conviction of the preacher, his vehement manner and wonderful eloquence infused into them a warmth and power which it is difficult now to understand. A collection of his sermons, letters, and tracts was published in 1771 (six vols., London, 8vo.), and his "Memoirs," by Dr. Gillies in 1772. See also "The Life of the Rev. George Whitefield, B.A.," by the Rev. L. Tyerman (two vols., London, 1876).

**WHITE FISH** (*Coregonus albus*) is a fish belonging to the family SALMONIDÆ, and to the same genus (*COREGONUS*) as the Vendace, Pollan, &c. The whitefish is one of the most valuable of American fresh-water fishes. It is found in the great lakes, from Lake Erie to the Arctic Sea, in Lake Champlain, in the smaller lakes of Canada connected with the St. Lawrence, and in the Mackenzie, Copernine, and other rivers flowing into the Arctic Sea. It measures from 1½ to 2½ feet in length, and weighs from 8 to 10 lbs. The body is elongated and thick, the head small and pointed, the mouth without teeth, and the tail forked. It is bluish-gray on the back, lighter on the sides, and white below. In October it enters the rivers from the lakes for the purpose of spawning, usually returning in three or four weeks. It swims in shoals, and feeds on insects and their larvæ, molluscs, aquatic plants, and occasionally on small fishes. It is caught principally by gill-nets, which are commonly spread under the ice. The flesh is bluish-white, changing when boiled to pure opaque-white. Attempts have been made to acclimatize this fish in this country.

**WHITEHAVEN**, a seaport and mining centre of England, in the county of Cumberland, situated in an inlet on the western coast, surrounded on the land side by heights, 10 miles south-west from Workington, and 303 from London by rail. In the reign of Queen Elizabeth it was only a small fishing village, containing six houses. The streets are regular, generally spacious, and cross each other at right angles. In the vicinity of the town, and also immediately under it, are extensive collieries, some of which are wrought to a distance of from 1 to 2 miles under the sea. There are also some valuable iron mines near the town. Much of the ore is sent to Staffordshire, Wales, Scotland, and Newcastle. The harbour is commodious, and is provided with a dock. The manufactures are of sailcloth, linen, check, anchors, cables, and nails. There are also iron and brass foundries, brick, tile, drain pipe, and earthenware works, and large roperies and yards for ship-building. In addition to coal, lime, iron, freestone, gypsum, and grain are exported, and West Indian, American, and Baltic produce are imported. Steam-vessels sail regularly to Liverpool, Ireland, and the Isle of Man. Some docks were constructed in 1877. There are several churches and places of worship for dissenters, various schools, union, infirmary, house of correction, mechanics' institution, custom-house, theatre, public office, news-room, library, &c., and some good commercial buildings have been erected, and a cemetery laid out. The environs of the town are very beautiful. Immediately to the south-east is the castle—the seat of Earl Lowther. The population of the borough, which returned one member to the House of Commons until 1885, was 13,374 in 1881.

**WHITE THROAT** (*Curruca cinerea*) is a British bird belonging to the family SYLVIIDÆ. It is a regular summer visitor to Britain, arriving about the third week in April, and departing in autumn. It is abundant throughout Europe. The Whitethroat is about 5½ inches in length, with the upper parts grayish tinged with rusty, the top of the head ash-colour, the throat and breast white, the latter tinged with rose colour in the male, the sides and abdomen rusty gray, the wings blackish, and the tail deep brown. It feeds on insects, and also on berries and small garden fruits. The nest is placed on a low bush or tangled thicket of brambles and weeds, and is composed of dried grasses; the eggs are four to six in number, and are greenish speckled and spotted with ashy-brown and ashy-green. It makes a good cage bird, and has an agreeable song. The Lesser Whitethroat (*Curruca sylvicola*) is a much rarer visitor to Britain. It resembles the preceding species closely in appearance and habits, but is rather shorter and more slender. It has a pleasing song.

**WHITGIFT, JOHN**, Archbishop of Canterbury, was the son of a merchant in Great Grimsby, Lincolnshire, where he was born in 1530. He had an uncle, Robert Whitgift, who was abbot of a monastery of black Austin canons, under whose influence his mind was early disposed to favour the doctrines of the Reformation. He studied at Queen's, Cambridge, and in 1555 was elected fellow of Peterhouse, whose master, Perne, was vice-chancellor at the time. He threw an effectual shield over Whitgift when Queen Mary sent down "visitors" to root out "heresy" from Cambridge, a kindness which he never forgot. At the accession of Elizabeth a career of great success and distinction opened before him. In 1563 he was made Margaret professor of divinity, in 1567 master of Pembroke Hall, and in a few months thereafter Queen Elizabeth appointed him master of Trinity. During his mastership he published the famous ordinance, over which it is now customary to make merry, so much have manners altered—namely, that any undergraduate caught bathing would be flogged publicly in the Common Hall and then set in the college stocks in the great quadrangle. In the same year he became regius professor of divinity, and was

succeeded by the eminent Puritan reformer, Cartwright, in the Margaret professorship. Whitgift challenged the zealous Cartwright to a public disputation, wrote against him, and eventually procured his censure and expulsion from the chair.

In 1573 Whitgift was made dean of Lincoln, rewarded thus handsomely by Archbishop Parker for undertaking to answer the famous Puritan "Admonition to Parliament," a task which he executed with such distinguished ability and learning that the "Answer to the Admonition" has sometimes been placed by English churchmen side by side with Jewel's "Apology and Defence"—the one as a vindication of the order of the Church of England against the Puritans, the other as a vindication of its doctrines against the Romanists. The work first appeared in 1572. His services in the controversy which raged over this question were soon afterwards rewarded with the see of Worcester, to which he was appointed in 1577; and upon the suspension of Archbishop Grindal by the Star-chamber, for refusing to put down the religious meetings of the clergy called prophesyings, Elizabeth pressed him to accept the primacy, which, however, he honourably declined during Grindal's lifetime. In 1583 he succeeded to it after Grindal's death, and from this time forward the history of his ecclesiastical administration becomes an important part of the history of the kingdom, and anything but a happy part of it. He did much to exasperate the Puritan spirit, and to prepare the troubles and confusions which followed in the next age. Though learned and acute, and not constitutionally cruel, he was narrow-minded, pertinacious, and severe. The queen offered him the chancellorship, but it was declined. He survived till the reign of James I., and took part in the celebrated conference of Hampton Court; but he died soon after, on the 29th of February, 1604, in the seventy-third year of his age. He founded in his lifetime an hospital and school at Croydon, which still exist, besides restoring the ancient hospital of Eastbridge in Canterbury. By judicious administration of Whitgift's and other charities the authorities in Croydon have founded and endowed an excellent public school (Whitgift School), which has already taken high university rank, and also a "middle school" for boys of humbler life, with several scholarships to the higher school. Probably the archbishop does more real service to his country now that he has been three centuries dead, than he did during his too active life.

**WHITING** (*Gadus merlangus*) is a fish belonging to the same family and genus as the Cod, esteemed on account of its delicacy and lightness as an article of food, in which properties it surpasses all others of its tribe. It is easily distinguished from the cod, haddock, and hie, by the absence of the barbel on the chin; and from the coal-fish and pollack, by having the under jaw shorter than the upper, a black spot at the base of the first ray of the pectorals, and the tail even at the end. It abounds on the coasts of Britain, especially in the West of England and South of Ireland, but becomes rarer in the North of Scotland. It is taken all the year round, but in the greatest abundance when it comes in large shoals towards the shore in the months of January and February, for the purpose of depositing its spawn. It feeds on molluscs, worms, crustaceans, and small fishes indiscriminately, and sometimes weighs several pounds, though usually it does not exceed one pound and a half. The usual length is from 12 to 16 inches. In colour it is dusky-yellow on the back, with the sides paler and the belly silvery white. The whiting prefers sandy bays, and is seldom found more than 3 miles from land. It is caught with hand-lines and long lines, baited with mussels or pieces of cuttle-fish. The flesh is pearly whited and highly esteemed as being easy of digestion, but loses its flavour very soon after the fish is caught: for this reason large numbers of whittings are salted and dried for the market and for exportation.



**WHIT'LOW** or **PARONYCHIA** is the name applied to any acute inflammation of the finger or thumb which tends to terminate in suppuration. There are several varieties of this disease, the most common being the cutaneous or superficial whitlow, which affects the last joint of the finger close to the nail, is attended by heat, tenderness, and aching for a day or two, when matter forms and raises the skin into a blister. If then the purulent fluid is allowed free vent, by opening the skin and immersing the finger in hot water, the whitlow usually heals kindly and requires no further treatment beyond a plain water dressing and the keeping of the hand suspended and at rest. When the pus is retained it causes considerable pain, and by burrowing into the tissues it finds its way into the sheath of the flexor tendons, and thus gives rise to feverishness and general constitutional disturbance. Treatment consists in free incision to relieve the finger from its pent-up matter, with prolonged immersion in hot water and the use of moist warm poultices or water-dressings. In the tendinous form of whitlow, commonly termed theal abscess, the inflammation is within the sheaths of the tendons, the pain is much more severe, and the pus, from inability to escape through the fibrous tissues, burrows into the palm of the hand, and even to the forearm and arm, producing severe constitutional symptoms, great danger to the hand and arm, and even so great a degree of fever and exhaustion as to endanger life. The treatment consists in free and early incisions, fomentations, and hot poultices, with the use of soothing applications locally, combined with good diet, stimulants, and tonics for the support of the general health.

**WHITSTABLE**, a town of England, in the county of Kent, 58½ miles from London, and about 6 miles east from Canterbury, of which city it is the port, being situate at the entrance of the Swale into the estuary of the Thames, oppo to the Isle of Sheppey. The population in 1881 was 1882, mostly engaged in the oyster fisheries. Whitstable, still a straggling little place, has a considerable coal trade, but its extensive oyster grounds, yielding oysters of the most delicate flavour, chiefly give it importance. The town is protected by substantial embankments from land-floods and incursions of the sea. Besides several dissenting chapels, it has two churches, one forming an important landmark. Ship and boat-building, mast, sail, and rope-making also afford employment. Some little distance off shore is a bank or causeway, dry at low water, and called the Street, popularly supposed to have been the site of a large town in the Roman era.

**WHITSUNTIDE** is probably a contracted form of White Sunday tide or time. In the early ages of Christianity the favourite seasons for administering the rite of baptism were Easter Sunday, the anniversary of the resurrection of Christ; and Whit-Sunday, that of the Jewish feast of Pentecost, when the apostles were "baptized with the Holy Ghost and with fire," and they themselves commenced their public ministry by baptizing three thousand persons. As emblematic of the spiritual purity which the rite of baptism is supposed to confer, those who received it were clothed in white, and the day is hence conjectured to have received its name of White Sunday (*Dominica alba*). Our ancestors seem to have indulged to excess at the season of Whitsuntide in all kinds of exercises and amusements, for which many of the parishes provided the needful stimulus, and out of which they claimed their due share of profit. For this purpose a house or barn, called the church-house, was set apart, and a quantity of ale was brewed, which was called Whitsun Ale or Church Ale, and was sold to the parishioners who came there to feast, drink, and gamble; the profits being applied to the repair of the church, and sometimes to charitable or other purposes. In England, at the present day, Whitsuntide is looked forward to by many thousands as the most popu-

lar holiday-time of the year. Whit-Monday is one of the bank holidays established under Sir John Lubbock's Act of 1871.

**WHITTIER, JOHN GREENLEAF**, an American poet, was born on 17th December, 1807, at Haverhill, Massachusetts, of Quaker parents. During his early years he worked as a farm-boy and shoemaker's assistant, receiving the rudiments of education in the winter evenings at home.

Whittier's first efforts as an author appeared in the *Newburyport Free Press* in 1826; a little later he both wrote for and edited a Boston newspaper, *The American Manufacturer*, and here he made his mark in journalism. In 1830 he became editor of the *New England Weekly Review* at Hartford, Connecticut. A year later he produced his first volume of poetry, "Legends of New England" (1831), a collection of Indian traditions, and shortly afterwards a poetical tale entitled "Moll Pitcher." A memoir of his friend, the poet and journalist Brainard, appeared in 1832, accompanied by Brainard's "Literary Remains." In 1833 he produced an essay, his first noticeable effort in the anti-slavery cause, entitled "Justice and Expediency, or Slavery Considered with a view to its Abolition." He was chosen in 1835 to represent his native town of Haverhill in the State legislature. In the same year he produced his earliest poetic volume of real worth, "Moss Megone," an Indian story of thrilling interest. In 1836 he became one of the secretaries of the American Anti-slavery Society, and two years afterwards was appointed editor of the *Pennsylvania Freeman*, one of the organs of his party. So eloquently, both in prose and verse, did he advocate the cause of the slave that his office was sacked by the mob. In 1840 he returned to Massachusetts and settled down at Amesbury, where he still lives. After a time he abandoned journalism, his last editorial relations being with the *Lowell Standard* and the *National Era*. In the meantime his literary efforts had been unintermitting, and they have placed him side by side with Longfellow, Lowell, and Bryant in the first rank of recent American poetry, a poetry which, while it possesses little force or dramatic power, and few, indeed, of the qualities of permanent art, has much in it to elevate and to charm the majority of readers. "Ballads," published in 1838, were followed by "Lays of Home" (1843), "The Stranger in Lowell" (1845), a collection of prose essays, "Supernaturalism in New England" (1847), "Voices of Freedom" (1849), and "Old Portraits and Modern Sketches" (1850).

In 1850 also appeared Whittier's "Songs of Labour and other Poems," followed by "The Chapel of the Hermits and other Poems" (1852), "The Panorama and other Poems" (1856), "Home Ballads and Poems" (1860), "In War Time and other Poems" (1863), "National Lyrics" (1865-66), "Snow-Bound, a Winter Idyl" (1866), which embodies early home recollections, and is one of Whittier's most deservedly popular poems; "The Tent on the Beach, and other Poems" (1867), "Among the Hills, and other Poems" (1868), "Miriam, and other Poems" (1870), "Ballads of New England" (1870), "The Pennsylvania Pilgrim, and other Poems" (1872), "Mabel Martin, a Harvest Idyl" (1876), "The Vision of Eckard, and other Poems" (1878), "The King's Mission, and other Poems" (1881), "The Bay of Seven Islands, and other Poems" (1885).

Biographical notices of Whittier have been written by W. S. Kennedy, F. H. Underwood, and R. H. Stoddard in *Scribner's Monthly*, vol. xviii. Numerous collections of his works have been published in America, and more than one selection of his poems in England. The most complete, as well as in every way the most satisfactory edition of the poet's works issued in this country is in Moxon's "British Poets," which has an admirable critical introduction by William Michael Rossetti.



**WHITTINGTON, SIR RICHARD**, Lord Mayor of London, the hero of the children's tale, was the third son of Sir William Whittington of Pauntley in Gloucestershire, and was born about 1350. It is certain that he became a London mercer of opulence and eminence, furnishing such royal trousseaus, to use the modern phrase, as that of the Princess Blanche, King Henry IV.'s eldest daughter. Four times lord mayor of, and in 1416 member for, London, he was a most munificent man, erecting almshouses and drinking fountains in London, assisting to found libraries, &c. His executors continued, by his instructions, the good work which he had begun. He appears to have died in March, 1423. (See the "Whittington" of the Rev. Samuel Lysons, London, 1860). It is conjectured that the mythus of the cat may have arisen from successful speculations of Whittington's in the coal trade, vessels used in it having at one period apparently been called "cats."

**WHITTLESEA**, called in Domesday Book *Witesie*, a decayed town of England, in Cambridgeshire, 5 miles E.S.E. of Peterborough, and 97 miles from London, has a town-hall, two churches, and a public library. The population of the town in 1881 was 3082; of the parish, 6455. Before the draining of the fens there existed, some 6 miles south-west of the town, a large lake, called Whittlesea Mere, which covered some 1570 acres of land, while the water was only 4 feet deep on the average. The waters have been drained off into the sea at Lynn by Walker's Cut, which is 30 miles long. This land is now exceedingly fertile and valuable.

**WHITWORTH, SIR JOSEPH**, an illustrious scientific and practical mechanician, was born at Stockport, 21st December, 1803. He received but a limited education, and at the age of fourteen he was placed in the cotton factory of his uncle, where he remained six years. He afterwards entered the works of Messrs. Crompton, Manchester, and becoming impressed by the need then existing for improved tools and machinery, he went to London, and obtained employment at one of the best tool makers in the metropolis. Here he discovered his method of making true planes and learned the method of making true screws, and having learned all that was known at London concerning tool making, he went back to Manchester and commenced business on his own account. In 1851 he first came before the public as an inventor of improved planing machines and of mechanical appliances for the manufacture of tools, his display at the great exhibition of that

year being one that attracted much attention. The outbreak of the Crimean War caused him to devote his attention to the manufacture of small arms and rifled cannon, and his experiments effected a complete revolution in their construction. His inventions secured the attention of the British and several continental governments, and the Whitworth works at Openshaw grew to a vast magnitude. In 1869 he was created a baronet, and the same year he devoted the large sum of £100,000 to the foundation of the celebrated Whitworth Scholarships. [See TECHNICAL EDUCATION.] He had been made a Fellow of the Royal Society in 1857, and also LL.D. of Trinity College, Dublin, and D.C.L. of Oxford University. He was also awarded the Albert gold medal by the council of the Society of Arts. He died at Monte Carlo, 22nd January, 1887.

**WHOOPING COUGH.** See HOOPING COUGH.

**WHORL.** See VERTICIL.

**WHORTLEBERRY.** See VACCINIUM.

**WHYDAH BIRD or WIDOW BIRD** (*Vidua*) is a genus of birds belonging to the family Ploceidae (WEAVERBIRDS), remarkable for the great development of some of the feathers of the tail in the male during the breeding season. The name is derived from Whydah in Western Africa, whence these birds were first introduced into Europe; the name was corrupted into Widow Bird, which was thought so appropriate to their sombre plumage and long black tails that the generic title *Vidua*, with the same significance, was given to them. The Paradise Widow-Bird (*Vidua paradisica*), a native of Western Africa, is the best known species, and is brought to this country as a cage-bird, on account of the beauty of its plumage and the sweetness of its song. It is about the size of a canary, and has the plumage black, with the neck orange-red and the belly white. In the breeding season the tail of the male exhibits two feathers about a foot in length, and two others, considerably shorter, but furnished with very broad webs; after the breeding season is over these ornamental plumes are shed. Other species are found in Africa, living in considerable troops, usually in marshy places, where they build their nests close together in tufts of reeds and rushes.

**WICK** (from Scandinavian *rik*, a bay), a seaport of Scotland, royal and parliamentary borough, and the capital of the county of Caithness, situated at the mouth of the river Wick, close to Noss Head, on the North Sea, is 161 miles from Inverness, with a station on the Caithness



section of the Highland railway, and 379 from Edinburgh. It is the principal seat of the herring fishery in Scotland, and comprises a large suburb named Pulteneytown, which lies a short distance up the creek or inlet, called Wick Bay,

on the opposite side of the river, and was built in 1808 by the British Fishery Company to serve as a port for the burgh. A handsome stone bridge affords communication between the two places. The chief buildings in Wick are

the town-house, banking offices, custom-house, and county buildings. It has a chamber of commerce and an agricultural society; and the county quarter sessions are also held here. There are Free Church, U.P., Congregational, Evangelical, Union, Episcopal, Baptist, and Catholic places of worship. Distillation and rope-making are carried on, but the inhabitants are principally dependent on the fisheries in the neighbouring seas. The fishing season commences about the middle of July, and usually continues for eight weeks, during which period the town is the scene of great bustle and activity. Many persons arrive from the Western Highlands to serve in the boats, depending chiefly upon the wages they may then earn to pay the rent of their small holdings. The fishery is liable to great fluctuations, the quantity caught in some seasons being four times as much as in others. Large numbers of the herrings, when cured, are sent to Germany, Italy, and the West Indies. The harbour of Wick was formerly much exposed, but after several failures, works entered on since 1883 have much improved it. Steamers run to Aberdeen and Granton, and a mail packet to Leith. Wick is the head of a parliamentary district, including the burghs of Cromarty, Dingwall, Dornoch, Kirkwall, and Tain, which returns one member to the House of Commons. The population of Wick in 1881 was 8053. The population of the royal burgh of Wick in 1881 was only 2954, but the entire parish contains 12,822 persons.

**WICKERSLEY STONE**, a coarse sandstone occurring in the Middle Coal Measures, quarried at Wickersley, near Rotherham, in Yorkshire. It is especially adapted for the manufacture of grindstones, which are used by the Sheffield cutlers.

**WICKLOW**, a maritime county in the province of Leinster, in Ireland, is bounded N. by the county of Dublin, N.W. and W. by Kildare, S.W. by Carlow, S. by Wexford, and E. by the Irish Channel. The greatest length north to south is 38 miles; the greatest breadth east to west is 33 miles. The area is 781 square miles, or 500,178 acres, and the population in 1871 was 78,509; in 1881 it was 70,386. Roman Catholics predominate.

*Physical Aspect.*—The northern part of the coast consists of low cliffs of the clay-slate formation, succeeded by a steep shore, which is continued for about 18 miles to the stream that separates Wicklow from Wexford. Total length of the coast-line, about 36 miles. The only harbours are formed by the mouths of the rivers Dargle, Vartty, and Avoca, and these are unimportant. The shore, moreover, is very dangerous on account of numerous sandbanks, the north and south extremities of which are marked by floating lights. There are also two fixed lights on Wicklow Head.

*Mountains.*—Wicklow is covered by the mountains which skirt the great limestone plain of Central Ireland on the south-east. They may be regarded as part of an extensive range crossing this portion of the country in a S.S.W. direction from the coast about Dublin Bay to the junction of the Barrow and the Suir, near Waterford. The central part of the range consists of a mass of granite, protruding through the slate rocks, the ends of which, though much shattered and confused, abut on each side against it. The slate rocks occupy the rest of the county on each side of the granite, and form summits of somewhat less elevation on its flank, extending on the one hand towards the sea, and on the other towards the great central limestone plain, no part of which is, however, in this district. Indeed, Wicklow is the only part of Ireland in which neither primary nor secondary limestone is to be found. It is altogether occupied by crystalline or schistose rocks.

The eastern flank of the mountains presents a varied aspect, being worn into deep glens and dells, which are lined with abrupt precipices or occupied by small lakes,

from whence begin those narrow transverse valleys whose general course to the south-east is distinguished by the most beautiful and romantic scenery. The chief of these are Glenmalur, Glen of Inail, Glen of the Downs, Devil's Glen, and the Vale of Avoca, the latter the scene of Moore's melody, "The Meeting of the Waters".—

"There is not in the wide world a valley so sweet,  
As that vale in whose bosom the bright waters meet."

The western side of the mountains, on the other hand, presents less variety; the glens and valleys, which exhibit fewer features of attraction, being more rounded and expanded. The rivers rising in these have a general tendency towards a north-west direction. On both sides of the central range the transverse valleys either merge into or cut across more expanded longitudinal vales by which heights are flanked, and beyond which rise offsets or detached groups and parallel ranges of lower hills. The general elevation of the Wicklow Mountains is from 1000 to 2000 feet. Table Mountain, near the head of the Slaney, is 2302 feet high. Lugnaquilla, near the source of the Little Slaney, 3039 feet, is the highest point. Most of the rocks are bare at their summits, but their base is generally covered with fine oaks and beeches. The well-known Irish weapon, the "shillelagh," derives its name from a wood near Arklow, which is celebrated for its growth of oak and blackthorn. There are some plains of considerable size on the east and south shores.

The rocks on the eastern flank of the granite abound in metals, while on the west there is a total absence of them. Galena, green and white lead ore, and copper pyrites are found in the granitic district. In the clay-slate tract are found silver, copper, iron, lead, zinc, tin, tungsten, manganese, arsenic, and antimony. The metalliferous portion of the clay-slate district is small, extending in length only from the border of the county, at Croaghlan Kinsheela, 10 or 11 miles in an N.N.E. direction, and having but a small breadth. The discovery of native gold near Croaghlan Kinsheela Mountain, in the parish of Arklow, took place about 1796, and many hundreds of people assembled daily to search for the precious mineral in the bed and on the banks of the Ballinvalley, or Goldmine River, a stream which rises in the mountain, and joins the Daragh just above its junction with the Avoca. Government took up the matter, and regular stream-works were established, but they were destroyed in the insurrection of 1798. They were resumed in 1801, with the addition of works for the discovery of auriferous veins; but the search was unsuccessful, and the attempt was abandoned.

*Hydrography.*—The central mountain range divides the county into two slopes, the eastern and the western. The former is drained by the Dargle (12 miles long), the Vartty (18 miles long), the Three Mile Water (6 miles long), the Potter's River (7 miles long), and the Avoca; the latter by the Liffey and the Slaney, with their respective affluents. These two last-mentioned rivers, although draining the western slope, afterwards turn eastward, and passing through openings in the mountain range, fall into the Irish Channel, as well as the rivers which drain the eastern slope.

The Avoca is formed by the combined water of the Avon-More (22 or 23 miles long), and the Avon-Beg (15 miles long). From their junction the river, now called Avoca, flows 9 miles to the sea below Arklow, receiving on its right bank the Daragh, or Derry (16 miles long), into which the Goldmine River (4 miles long) and the Ow (10 miles long) both fall.

The Liffey has a course of 19 or 20 miles, first W.N.W., then south-west (partly within and partly upon the border of the county), to the place where it quits Wicklow altogether to enter the county of Dublin, to which it chiefly belongs.

The Slaney rises on the northern slope of Lugnaquilla,

and flows in a winding channel 12 miles west, to a little below its junction with the Carrigower; it then turns south, and flows 6 miles, by Baltinglass, into Carlow, to which county, and to Wexford, the lower part of its course belongs. Its whole length in Wicklow is about 18 miles.

Some of the streams in this district are rapid in their current, and occasionally form striking waterfalls. The lakes are all small, but most of them are situated in scenes of surpassing loveliness. The principal are Loughs Day, Tan, Bray, and Glendalough.

*Climate, Soil, &c.*—The climate of the county is exceedingly mild and agreeable. The soil is very fertile in the lower tracts and along the river-courses. The crops are chiefly oats, potatoes, and wheat. Pasturage is also much attended to. The occupations of the people are generally agricultural. The peasantry are quiet and usually industrious; and are stated to be generally handsome, with Roman profiles. The fisheries are neglected, and the manufacture of flannel, once extensive, is now nearly extinct. Mining operations are, however, rather extensively carried on. In consequence of the beauty of its scenery, this district is much frequented by tourists visiting Ireland; and in many places there are noble residences in the midst of extensive and well-wooded parks, especially between Bray and the town of Wicklow.

*Divisions.*—The county is divided into eight baronies and fifty-nine parishes. It is in the Leinster circuit, and the assizes are held at Wicklow. The county sends two members to Parliament.

*History.*—Wicklow appears to have been included in the dominions of the Caici (Gr. *Kaukoí*). The Slaney was perhaps the *Modonus* (Gr. *Modonos*) of Ptolemy; and the *Avuca* may be safely identified with the *Oboca* (Gr. *Oboka*) of the same writer. In the division of Leinster and Munster into shires by King John, what is now the county of Wicklow was included in that of Dublin, nor was it rendered independent till 1605.

A remarkably fine group of churches, sometimes called the seven churches, remains in the secluded valley of Glendalough, about 13 miles west from the town of Wicklow. Glendalough, at the time of the Anglo-Norman invasion (1169) was a bishopric, and contained a cathedral and other ecclesiastical buildings, which were then plundered and burnt. Remains exist of several other churches and monasteries, and of some old castles. Tumuli, rathis, cromlechs, and other Celtic antiquities are also met with in the county.

WICKLOW, the county town of the above county, 27 miles S.S.E. from Dublin by rail, stands on the south side of the estuary of the Vartry, called the Broad Lough, which is formed by a low peninsula running parallel to the coast. Some of the mining and agricultural produce of the neighbourhood is exported, though it is not a port for customs purposes. A little fishing is carried on near the town, but it is confined to small craft, as there is a bar at the entrance to the harbour. Wicklow consists of narrow streets irregularly laid out, being little better than a group of lanes. At the point of the peninsula, which is called the Murrough, is a suburb that is connected with the town by a bridge of eight arches. There are a church, Roman Catholic chapel, Presbyterian, Quaker, and Methodist meeting-houses, county court-house, infirmary, the remains of an old castle, and the ruins of a Franciscan friary. Wicklow is the smallest assize town in Ireland. It communicates with Dublin by the Wicklow, Wexford, and Waterford Railway, and is visited for sea-bathing. Population in 1881, 3391.

**WICKLIF.** See WYCLIF.

**WIDAR**, the god of silence in the Norse mythology, bearing a keen sword and wearing iron-nailed shoes. He is a son of Wotan (Odin), and listens with his usual im-

penetrable reserve to the prophecy of the Norns that he should at the break-up of the world avenge his father by slaying the Fenris Wolf, the monster who was destined to kill Wotan, and that he should afterwards live for ever in the blissful peace of the renewed world. See RAGNAROK.

**WIDGEON** or **WIGEON** (*Marca*) is a genus of Ducks belonging to the subfamily Anatinae, distinguished by having the bill shorter than the head, gradually depressed and narrowed towards the point, with a strong broad nail, and the upper lunellae prominent; the wings are long and pointed; the tail is short and pointed; the toes are fully webbed, and the hind one is lobed. There are ten species, migratory birds, found in various parts of the world, on the sea-shore or the margin of lakes and rivers.

The Common Widgeon (*Marca penelope*) is a regular winter visitor to Britain, and breeds in small numbers in the northern parts of Scotland. It is widely distributed over Europe and Northern Asia as far south as India, and is not uncommon along the Atlantic coasts of North America. The male is about 18 inches in length, and has the head and neck reddish-brown, with the top of the head cream-coloured; the upper parts are grayish-white, crossed, with irregular zigzag lines of black; the primaries are dark brown; the speculum is green, encircled by black; the throat is pale rufous, and the breast and belly white. The female is a little smaller, and its plumage exhibits various shades of brown. The widgeon appears in large flocks during its migrations, which are performed at night. It feeds chiefly on grasses. The nest is placed on a clump of rushes or a tuft of heather, and contains from seven to ten creamy-white eggs. The note is a shrill whistle. The flesh is highly esteemed for the table. The American Widgeon (*Marca americana*) is a common species throughout North America, visiting Central America and the West Indies in winter, and has occasionally strayed to Britain. It is larger than the common widgeon, measuring about 22 inches in length, and differs chiefly in having the head and neck grayish, spotted and banded with black, and the top of the head nearly white, with a broad green patch around and behind the eyes.

**WIDNES**, a manufacturing town of England, in Lancashire, 13 miles south-east of Liverpool, and 188 miles from London, having 24,935 inhabitants. In 1851 it had less than 2000. It is excellently situated for obtaining coals and carrying goods, and has become the seat of extensive manufactures of a kind that require to be carried on at a distance from great towns. Chemical, alkali, soda, soap, candle, grease, manure, copper-smelting, and iron works are here in full operation. Large docks were formed in 1866, and in 1868 a remarkable girder bridge was opened across the Mersey. It is 1000 feet long and 95 feet above high-water level, is supported by two immense stone piers 300 feet apart, carries two lines of railway, and has paths for foot passengers on each side. It was here that an ingenious plan was first adopted for converting salt into silicate of soda. It was of immense importance to the glass manufacturers, who, by simply fusing the silicate of soda with different proportions of lime, sand, and colouring matter, obtained glass of any hue and quality.

**WIELAND, CHRISTOPH MARTIN**, a distinguished German author, was the son of a Lutheran pastor, and was born near Biberach, in Swabia, in 1733. During his course of studies at a school near Magdeburg and at the University of Tübingen he read extensively in French and English, as well as in ancient literature. His love of poetry gained for him an introduction to Bodmer, with whom he lived at Zurich for two years. The influence of this distinguished Pietist led him to write moral epics, one on "Cyrus," and another on "The Trial of Abraham." In a work called "The Sentiments of a Christian" he criticised light literature with great severity. But when he left Zurich to reside at Biberach Wieland, influenced by his reading of

French romances and of Sterne, whose "Tristram Shandy" he read a hundred times, adopted an entirely different tone. In his tale of "Don Sylvio" (1764) he ridiculed pietism. In 1762-66 he produced the first German translation of Shakespeare. In 1762 he published his satirical romance "Nadine," and in 1766 "Agathon." The poem "Musarion," in which, as in "Agathon," Wieland compares ethereal and worldly love to the advantage of the latter, appeared in 1768, and a year later he was appointed professor of philosophy at Erfurt. In 1772 Wieland went to Weimar, where he was engaged as tutor to the sons of the Grand Duchess. He established there his literary journal, *The German Mercury*, which had a long success. There also he met Goethe, with whom he continued friendly till his death; indeed Jacobi asserts that Wieland was the only literary man of his time who was not envious of Goethe's superiority. In 1773 he wrote "The Men of Abdera" ("Geschichte der Abderiten"), the best of his prose works. His best poem, "Oberon" (1780), is a kind of German "Don Juan," and is essentially Byronic in character. Two romances followed, "Peregrinus Proteus" in 1791 and "Agathodemon" in 1798, but the chief literary work of Wieland's later life was his translation of the classics, as of "Lucian" (1788-89) and "Cicero's Letters" (1808-12). In 1798 he retired to Ossmanstadt on the Ilm, between Weimar and Apolda, and there he is buried, though he spent the closing years of his life at Weimar. He died in 1813.

**WIERTZ, ANTOINE-JOSEPH**, a celebrated Belgian painter, was born at Dinant, 22nd February, 1806. He studied under M. Van Brée in the Antwerp Academy, where in 1832 he won the grand prize of Rome by a painting of "Scipio." At Rome he painted a "Patroclus" and one or two other pictures on a large scale, and was in 1837 elected a member of the Academy of St. Luke. Returning to Brussels he set to work upon several historical and religious compositions of colossal proportions, maintaining himself during their progress by painting smaller genre pictures and portraits. He left several of these remarkable pictures to the nation; they are of undeniable power, though occasionally the weird ghastliness of the painter's imagination is pushed to excess, and the "Musée Wiertz" at Brussels is still a principal object of interest in that city. Wiertz died 18th June, 1865.

**WIESBADEN**, a famous watering-place of Germany, in the Prussian province of Hesse-Nassau, much resorted to by visitors from all parts of Europe, is a handsomely-built town of modern appearance, in which hotels, lodging-houses, saloons, and gardens are conspicuous, with a throng of upper-class strangers from June to September. The resident population is about 50,000, but during the aforesaid months it is greatly increased. It is situated within a short distance of the Rhine, 26 miles by rail west of Frankfurt, in a delightful valley open towards the south, but inclosed on the other sides by the swelling hills of Taunus, which serve as a screen from the cold winds, and render it a suitable place of abode for delicate persons in winter. There are fifteen mineral springs of the same alkaline quality, closely corresponding also in their temperature, and hence believed to be the outpourings of a common source. The principal, called Koechbrunnen, "boiling spring," has a cloud of vapour resting upon the surface of the water, and is in a state of ebullition, with the heat of 166° Fahr. The town occupies the site of a Roman station.

**WIFE.** See HUSBAND AND WIFE.

**WIGAN**, a market-town, and an ancient parliamentary and municipal borough of England, in Lancashire, 195½ miles from London, stands on the Douglas, which is crossed by three bridges, and is navigable from Wigan to the estuary of the Ribble. It has a station on the London and North-western Railway, at the intersection of the Lanca-

shire and Yorkshire line. The town is of considerable antiquity, and has enjoyed the right of returning members to Parliament from the time of the first Parliament called by Edward I. The old streets are irregularly built, but the more modern ones near the river have many good houses. From its situation on the richest part of the Lancashire coal-field, the wealth and population of the borough have increased rapidly with the development of its manufactures of cottons, cotton yarn, and linen. The extensive coal-mines give employment to a large number of inhabitants; there are also iron-works and foundries for machinery, tools, nails, brass wares, and spades. Cannel coal, chiefly used for the manufacture of gas, is found here in great abundance. The Rose Bridge Mine, 808 yards deep, is the deepest mine in Britain, if not in the world. It was sunk from 600 yards to the lower depth in 1869; the temperature at the bottom is found to be 93½°. The Leeds and Liverpool Canal passes through the town, and conveys the coal of Wigan to Liverpool and the whole intervening country. It is also carried to London in large quantities along the London and North-western Railway. The parish church is a very handsome structure. Wigan has numerous churches, several Roman Catholic chapels, and various chapels for dissenters. There are also a town-hall, cloth hall, market-hall, and fish market, sessions hall, Moot or Manor Hall, corn exchange, banks, barracks, mechanics' institute, corn mills, cotton factories, linen works, iron-foundries, railway works, chemical works, and breweries, free library, a school of mines and industry, free grammar and blue-coat schools. There is also an extensive public park. A handsome and commodious infirmary was opened by the Prince of Wales in 1873. The municipal borough is divided into five wards, and is governed by a mayor, ten aldermen, and thirty councillors. The population of the borough and township in 1881 was 48,194. The parliamentary borough, which returns one member, is co-extensive with the municipal borough. This town supported the royalists in the Civil War, and the old manor house was occupied by Charles Edward in 1745. On the road leading northward from the town is a pillar in memory of Sir John Tyldesley, who was killed at the battle of Wigan Lane, when James, earl of Derby, was defeated there by Lilburne in 1659. The early history of Wigan, which derives its name from the Saxon *wīg*, a fight, is associated intimately with King Arthur, some of whose battles are supposed to have been fought on the Douglas. In a barrow, called Hasty Knoll, which has now disappeared, human bones were found in enormous quantities, and in another a great quantity of horse-shoes. A battle was fought in this same district between the Saxons and Britons, in which the latter were victorious.

**WIGHT, ISLE OF**, on the south coast of England, is separated from Hampshire by a channel called the Solent Sea (*Pelagus Solvens* is the Latin name which Bede gives to it). The average breadth of this channel is less than 4 miles. It is narrowest to the west of Yarmouth, where it is contracted to about three-quarters of a mile by a narrow tongue of gravelly beach which projects nearly 2 miles from the Hampshire coast, and at whose extremity is situated Hurst Castle. At Spithead, which forms the entrance to the channel from the east, the width varies from 2 to 3 miles. Its current, both with the rising and ebbing tide, is extremely strong. The form of the island is that of an irregular rhomboid or lozenge. The longer diameter, from the Foreland on the east to the Needles Cliff on the west, is 22½ miles; the shorter diameter, from West Cowes on the north to St. Catharine's Point on the south, upwards of 13 miles; the circumference is about 56 miles, and the area 98,320 acres. The population in 1881 was 73,633.

**Coast and Surface.**—The east and west coasts consist mostly of precipitous cliffs. On the west those of Alum

Bay, distinguished by their vary-coloured strata, which is owing to the presence of oxide of iron, rise to the height of 300 feet. The unbroken face of a chalk ridge forms the south side of the bold promontory of which the insulated masses of chalk called the Needles were anciently a continuation. The extreme rock is crowned with a lighthouse, 100 feet in height, erected in 1858. From Scratchell's Bay a line of chalk precipices, in many places nearly perpendicular, extends to Freshwater Gate; the western part, called the Main Bench, being 617 feet high, and pierced with numerous picturesque caverns, from 90 to 200 feet in depth. The chalk is continued eastward, the height gradually diminishing till it terminates at Compton. Thence a succession of narrow terraces, in some places quite perpendicular, gradually increase in height to the south front of St. Catharine's Hill, which rises upwards of 400 feet from an elevation of 400 feet above the sea. Here, on the lower cliff, stands an elegant lighthouse, erected in 1840. Its summit is 201 feet above low-water mark. From St. Catharine's to St. Boniface, landslips have formed a series of terraces, which have long been firmly settled, and thence to Dunnose occur the ruins of similar landslips, produced by the action of water on a soft under stratum of blue marl, but more recent, broken, and irregular. From Dunnose northward an almost uniform line of perpendicular cliffs, at Luccombe 200 feet high, gradually decreases in height till it totally disappears at Sandown Bay; but in about half a mile the red cliffs of Yaverland soon rise to the altitude of 200 feet. These are succeeded by the vertical rampart of the chalk range, which, as seen at Culver Cliff, 259 feet high, is similar in character to the Needles promontory, but not so lofty.

The Isle of Wight is one of the most beautiful parts of Great Britain, being finely diversified with hills, dales, woods, towns, villages, and gentlemen's seats. The surface lies for the most part at a great elevation above the sea. A range of high chalk downs extends, with some interruptions and irregularities, from the Culver Cliff on the east to the Needles on the west, and thus forms a kind of backbone to the island. In this range there are three principal depressions: one between Yaverland and Brading, three-quarters of a mile wide, through which the eastern Yar flows; a second between St. George's Down and Carisbrooke, half a mile in breadth, through which the Medina winds; and a third at Freshwater, hardly 100 yards wide, watered by the western Yar. The highest point of the range is Mottistone Down, 698 feet above the sea. Ashy Down is 424 feet, and Afton Down 500 feet. The south side of the island consists of a high range of downs, whose upper part, on the west, forms a portion of the chalk ridge; on the south the chalk lies in horizontal strata; on the east extend green sandstone and iron sand. A broad valley separates the lofty range of south downs from the central chalk. The north side, which is in general less elevated than the south, is agreeably diversified with wooded hills and pastoral valleys.

The most extensive of the valleys are those of the eastern Yar, alluded to above, which comprise a large portion of the most fertile land in the island. The basin of the Medina, which is in general very narrow, forms the central valley; and the south-western is bounded east by St. Catharine's Hill, and north by the chalk ridge. Numerous small streams drain this tract, but as the coast is high, they enter the sea by narrow chasms called Chines. The most remarkable are Blackgang, Walpan, Ladder, and Cow-ridge, on the south coast; Luccombe and Shanklin on the east. The latter is a deep glen, very finely wooded, and opening out upon the sea-shore in such a manner as to command a noble marine prospect. Blackgang is bare and sombre, and shaped like a horse-shoe. Less known, but in some respects the most picturesque, is Ladder or Chale Chine, where the cliffs are about 200 feet in height. The

culminating point of the island is St. Catharine's Hill, whose summit is 800 feet above the sea.

*Rivers.*—The Medina rises near the north-east foot of St. Catharine's Hill, and runs in a narrow valley till near Gatcombe, where its basin widens considerably; it then breaks through the chalk ridge near the centre of the island, flows on the east side of Newport, expands immediately below the town into a noble estuary, and enters the sea 5 miles to the north, between East and West Cowes. The eastern Yar, or Brading River, has its source near Niton, in the same range of hills as the Medina. It passes through a narrow chasm in the chalk hills between Brading and Yaverland, and forms Brading Haven, which at high water appears like a beautiful lake of 800 acres, but at low water is a surface of muddy sand, traversed by numerous small streams. The western Yar rises near Freshwater Gate, and falls into the sea at Yarmouth; it is an estuary through nearly its whole length, which is less than 3 miles. The Wootton and Newtown rivers are small streams, forming similar estuaries.

*Geology.*—The whole series of the strata composing the Isle of Wight are exhibited in its precipitous cliffs in a very distinct manner; and some of the phenomena which they present are extremely curious. The north side of the island consists of the strata above the chalk; the centre and the higher grounds of the south side of the chalk; and the lower part of the south and the south-east districts of the strata below the chalk.

The most extraordinary circumstance in the geological structure of the island is the vertical or highly-inclined position of its central chalk ridge and of the plastic clay and London clay immediately north of it. The strata further to the north and to the south are horizontal, or nearly so, those to the south being the chalk and underlying strata which remain undisturbed, while those to the north are more recent formations deposited horizontally and unconformably on the broken edges of the vertical strata. Two great sections of the latter are exhibited by the Culver Cliff and the cliffs of Whitecliff Bay on the east, and by the Needles Cliff and the cliffs of Alum Bay on the west. In Whitecliff Bay the plastic clay and sands form two low perfectly vertical walls. Rounding the cape to the south, the chalk of the Culver Cliff rises to a great height, at an angle of about 70 degrees, dipping N.N.E. and gradually diminishing to about 50 degrees. In Alum Bay a section quite conformable, but more extensive and distinct, is presented. On the south the lower strata of chalk and chalk-marl are at an angle of about 50 degrees N.N.E., the upper strata of chalk at an angle of about 70 degrees; further to the north the plastic clay and its sands, perfectly vertical; still further to the north the London clay, also vertical; and further north still, a bed of yellow sand inclined at an angle of 60 or 70 degrees N.N.E. The plastic clay in Alum Bay consists of clays, marls, and sands in countless layers, some extremely thin, of every variety of colour. The line along which the disturbing force acted that occasioned the vertical position of these strata may be traced as far as Abbotsbury, in Dorsetshire. The whole of the north side of the island is considered to belong to these formations.

The south coast, from Dunnose to St. Catharine's, is composed in the upper part of chalk and chalk-marl in nearly horizontal strata; the centre is green sandstone, with dark marl underneath, and then ferruginous sand. The region of the Undercliff extends along the eastern and southern coast from Luccombe to Blackgang Chine, and forms a tract of really wild and wonderful scenery, about 7 miles long, and from a quarter of a mile to a mile in breadth. Owing to its peculiar position it enjoys a singularly genial climate, which is particularly adapted to invalids suffering from pulmonary complaints. The death-rate of the district is among the lowest in the kingdom.

Much of the prettiest scenery of the Undercliff lies about the little villages of St. Lawrence and Whitwell, and in the neighbourhood of the picturesque seats of Steephill, Mirables, Beauchamp, Knowles, and Mount Cleves. At Puckaster Cove Charles II. was once driven ashore by stress of weather.

*Soil, Agriculture, &c.*—North of the chalk ridge the predominating soil is a stiff clay, extremely well suited for the growth of wood, and especially oak, which, in the neighbourhood of East Cowes and St. Helen's, grows down to the water's edge. The northern half of the island is much inferior to the southern as arable land. The soil of the whole of the latter is generally a rich red loam, in some parts inclining to sand, in others stiffer and more clayey, but everywhere extremely fertile. Timber does not flourish in these districts. The lower tracts are employed in tillage, and the produce of wheat is greater than in almost any other part of the kingdom. The pastures and meadows are rich, but few oxen are reared. Dairies are attached to most of the larger farms. Numerous flocks of sheep thrive upon the downs, and the Isle of Wight lambs especially find a ready market. The cliffs on the south side are the resort of vast numbers of sea-fowl. The roads in the island are generally good, but narrow, and all the principal towns are now connected by railway. There is regular steamboat communication with Southampton and Portsmouth.

The climate is very mild, especially in the valleys and sheltered parts of the south side of the island. Laurels, myrtles, geraniums, and various kinds of delicate evergreens flourish through the winter. The neighbourhood of Bonchurch and Ventnor enjoys very favourable climatic conditions, to which Sir James Clark first directed the public attention. He pronounced it unequalled in England as a winter residence for invalids. The mean annual temperature is as high as 51° 72'. The prevailing winds are west, south-west, and north-west, which blow, on the average, 180 days out of the 365.

*Divisions.*—The Isle of Wight is included in the county of Southampton (Hampshire). It returns one member to the House of Commons.

There are no manufactures of any importance in the island, but agricultural produce, wools, lambs, and white sand from Freshwater Bay, for the manufacture of glass and china, are exported.

*Antiquities and Gentlemen's Seats.*—The Isle of Wight contains some interesting memorials of the past. The Longstone, near Mottistone, is generally considered to be the remains of a Celtic *cromlech*, or burial-place, and at Rowborough and Gallibury may be traced the lines of ancient British pit-villages. On the lofty downs are scattered numerous Celtic and Saxon tumuli, or barrows, which have mostly been opened, and their contents may be examined in the museums at Ryde and Newport. The Roman relics are few, except in the case of villas discovered at Carisbrooke and Brading. Quarr Abbey, 3 miles from Ryde, is worth a visit. The ruins of this once opulent foundation, established in 1134, are Early Decorated in style. At Wootton, in the Undercliff, are the ivy-clad remains of a very ancient manorial mansion, of about the time of Henry III. Carisbrooke Castle, where Charles I. was confined, in a room still extant, is very interesting. The churches at Yaverland, Thorley, and Shalfleet exhibit indisputable Norman features.

Osborne, the royal marine residence, is an edifice in the Italian style. The Jacobean mansions and manor-houses are of uninteresting character, as Nunwell, the seat of the Ogländers, a family of unbroken Norman descent, Swainstone, Clifale farm, Arretton farm, Mottistone Manor-house, Sheat Manor-house, Kingston, North Court, and Yaverland Manor-house.

The other more important seats are:—Westfield, near

Ryde; Appuldurcombe, formerly the residence of the Worsleys; Appley Tower, near Ryde; the Priory, St. Helen's; St. Clare, near Ryde; Steephill, near Ventnor; East Cowes Castle and Norris Castle, near East Cowes; Brook House; East Dene, the Maples, and Underrock, near Bonchurch; Hillwood Park and Fairlie, near West Cowes; Fernhill, near Wootton; and the Marine Villa, St. Lawrence.

**WIGS** are of immense antiquity. There is an ancient Egyptian wig at the British Museum at least 4000 years old, so long ago did men desire by false hair to mask their baldness or to add to scanty locks. The Romans of the empire used them freely, and dandies such as the Emperor Commodus powdered and scented them with perfumed gold dust. The modern use of wigs as ornaments, so that the natural hair was actually shaved off to be replaced by huge fabrications of horse-hair, dates from Louis XIII. of France early in the seventeenth century, and culminated in the enormous *perruques* of Louis XIV. and our Charles II. It took over a century and a half to get rid of these costly useless articles, a very fine one of which was worth £110, and after a phase of hair-powder and pigtails we have reached our present natural style. Baristers, judges, and some few functionaries still wear wigs as official costumes.

The word is short for *periwig*, the English form of the French *perruque*, from the Italian *piluccare*, to pluck out hairs; Latin, *pilum*, a hair.

**WIGTOWNSHIRE** or **WIGTONSHIRE**, the most southern county of Scotland, is bounded E. by Wigtown Bay, N.E. by Kirkcudbright, N. by Ayrshire, W. by the Irish Channel, and S. by the Irish Sea. The area is 512 square miles, or 327,906 acres. The population in 1881 was 36,611, of whom 20,468 were females, which was a decrease of 5484 since 1861.

*Physical Aspect.*—The county is indented by spacious bays and harbours. Wigtown Bay runs inland 10 miles, diminishing from a width of 8 miles until it terminates in the narrow river Cree. Luce Bay forms an indentation in the south, stretching inwards about 15 miles, and the distance between the two headlands of Barrow Head and the Mull of Galloway is about 15 miles, the latter being the most southern point of Scotland. Loch Ryan, on the north-west, extends inland about 8 miles to Stranraer, its breadth varying from 2 to 4 miles.

The surface of Wigtownshire, though consisting of considerable eminences and hills, is less elevated above the level of the sea than that of any other county in Scotland. The principal summits vary from 400 to 900 feet in height. From the general mildness of the winter the county has been termed the Devonshire of Scotland. It is, however, rather moist, the rainfall being somewhat excessive. Wigtown may be divided into three districts—the Rhynns (peninsula), which lie west of a line drawn between Luce Bay and Loch Ryan, and were formerly called the Rhynns of Galloway; the Machers (flat country), lying between Wigtown Bay and Luce Bay; and the moors, which include the remainder, being more than one-third of the whole county. Of fresh-water lochs there are about forty altogether, but the largest is only 2 miles long. The only navigable rivers are the Cree, open for about 4 miles, and the Bladenoch, for a still shorter distance: both empty themselves into Wigtown Bay. The Luce, which falls into Luce Bay after a course of 21 miles from the borders of Ayrshire, is easily crossed on foot, except when floods occur. The other streams are comparatively insignificant. Wild fowl, pike, perch, carp, salmon, and cod are caught. The soil of the Machers and the Rhynns is for the most part a hazely loam, dry, and adapted for turnips. A tract of rich alluvial land occurs in the eastern part of the county. The moors are bleak and barren, and in many places consist of peat-land partially covered with water; elsewhere blackfaced and other sheep are fed on them.



*Soil, Products, &c.*—A great part of the soil is alluvial and very fertile, but the central and northern districts of the moors have large tracts, quite unfit for cultivation or grazing purposes.

Marl is abundant; bone-dust and guano are used to improve the turnip lands. Some of the dairies produce cheese very much resembling the Somersetshire Cheddar. Labourers are mostly Irish, and wages low. The black polled Galloway breed of cattle, so much in repute, is indigenous in this county. These animals are remarkable for their gentleness and beauty, and are fattened and sent in great numbers to the English markets. A considerable proportion of the live stock is, however, of the Ayrshire breed. The handsome and active little horses, known as Galloways, are fast becoming extinct. Slate and sandstone, with traces of copper and iron, are found. Roofing and paving slate and stone for building purposes are quarried, and bricks are manufactured. A branch of the Glasgow and South-western Railway passes through the centre of the county.

*Divisions.*—Wigtownshire is divided into seventeen parishes. One member is returned to Parliament for the county.

*History.*—Wigtownshire was the seat of the Novantes in Valentia, and was afterwards part of Northumbria. At a later period it was settled by a tribe of Irish Picts, under their chiefs, called the Lords of Galloway. There are several Druidic stones, cairns, Picts' houses, and camps to be seen. The Devil's Dyke may be traced near Loch Ryan. Other antiquities comprise Glenhee Abbey, Whithorn Cathedral, and the Castles of Larg, Mochrum, Castle-Stewart, Garthland, Castle-Kennedy, Baldoon, &c.

WIGTOWN or WIGTON, the county town of Wigtownshire, and a seaport, stands on the west side of Wigtown Bay. It is situated near the river Cree, on an eminence 200 feet above the sea, 129 miles by road from Edinburgh, in the midst of a rich alluvial district, and the little coasting trade of the port consists chiefly in conveying the agricultural produce of the neighbourhood to Liverpool. It has a station on the Wigtownshire Railway. Wigtown chiefly forms one long street, with a green in the centre, where are two town crosses. The chief buildings are the parish church, the Free church, the U.P. church, and a Roman Catholic church, and the town-hall and court-house, built in 1863. The harbour lies about a quarter of a mile south, in the estuary of the Bladenoch Water, and admits small vessels of 300 tons burden. The population of the town in 1881 was 1789; of the parish, 2198. Wigtown is said to have been founded by the Saxons after a *wig*, or battle, with the original British. In the churchyard are monuments to two female martyrs, who were drowned here in 1685 for their adherence to the Covenant.

**WIGWAM**, a corruption of the native term for hut in the North American Indian languages. The Algonquins of Massachusetts call their huts or houses *wick*, which, with possessive and locative affixes, becomes *wickou-mu-at*, in his house, whence *wickwam*, and later on *wigwam*.

**WIKING or WIKING.** See **VIKING**.

**WILBERFORCE, WILLIAM**, an English philanthropist, was born at Hull, 21st August, 1759, of an old and wealthy Yorkshire family. He was educated at Cambridge, where he formed a friendship with Pitt, and devoting himself principally to classics he graduated with credit. On his majority he came into a considerable fortune, and adopting a public career he was returned to Parliament as member for Hull. At London he moved in the best society, and enjoyed the friendship of Pitt, Fox, Sheridan, and other distinguished men of that period. In 1784 he did good service to Pitt's ministry by carrying the county of York, and about this time his religious convictions became deepened and strengthened through the influence of his friend Milner, the dean of Carlisle. In 1787 he was

active in the formation of a Society for the Discouragement of Vice, and shortly afterwards he commenced that arduous struggle against negro slavery for which his name will ever be held in honour. Outside the House of Commons the agitation was carried on by Granville Sharp, Thomas Clarkson, Zachary Macaulay, and others, while Wilberforce was intrusted with the work of forcing the subject of slavery upon the attention of Parliament. He introduced a bill for the abolition of the slave-trade in 1789, but it was not until 1804 that the bill passed the Commons, and then it was thrown out by the Lords. It was lost the following year in the Commons, and was not carried through both Houses till 1807. He next took up the agitation for negro emancipation, and continued it up to the close of his public career in 1825, when from failing health he was compelled to retire from Parliament. Three days before his death the Emancipation Act was passed, and he thanked God that he had been permitted to see the triumph of the cause. He died in London, 29th July, 1833, and was buried in Westminster Abbey, where a statue was erected to his memory. His "Practical View of the Prevailing Religious System, contrasted with Real Christianity," published in 1797, was for a long time very popular, and it was translated into the French, Italian, Spanish, Dutch, and German languages. He was also the author of numerous pamphlets and a volume of "Family Prayers." His income was largely devoted to charity. See his life by his two sons, Robert Isaac and Samuel (five vols., London, 1838; revised and condensed, 1868), and "William Wilberforce: his Friends and his Times," by John C. Colquhoun (London, 1866).

ROBERT ISAAC WILBERFORCE, second son of the preceding, was born at Clapham, 19th December, 1802, graduated at Oxford in 1823, and taking orders in the Church of England, became archdeacon of the East Riding of York. He was the author of numerous historical and theological works, the tone of which was in harmony with the doctrine of the Church of England; but in 1854 he resigned his preferments, was received into the Roman Catholic Church, and entered the ecclesiastical academy at Rome, with the design of becoming a priest. He died at Albano, Italy, 4th February, 1857.

SAMUEL WILBERFORCE, brother of the preceding, was born at Broomfield House, Clapham, 7th September, 1805. He was educated at Oxford, was ordained in 1828, and was appointed rector of Brightstone, in the Isle of Wight, in 1830. In 1837 and 1845 he was select preacher before the University of Oxford; in 1839 he became archdeacon of Surrey, rector of Alverstoke, and chaplain to Prince Albert; in 1840, canon of Winchester Cathedral; in 1841, Bampton lecturer; in 1844, sub-almoner to the Queen; and in 1845, dean of Westminster. In November, 1845, he was made bishop of Oxford, and in 1869 was transferred to the see of Winchester. He was an eloquent preacher, and one of the ablest debaters in the House of Lords. He was killed by a fall from his horse, near Dorking, 19th July, 1873. A massive stone cross has since been erected on the spot where he died. His principal works are "Eucharistica" (1839); "Rocky Island and other Parables" (Lond., 1840); "Agathos and other Stories" (Lond., 1840); "History of the Protestant Episcopal Church in America" (Lond., 1841); "Heroes of Hebrew History" (Lond., 1870); "Essays contributed to the *Quarterly Review*" (Lond., 1871); and several volumes of sermons. See his life, by Canon Ashwell (Lond., 1879), continued by his son Reginald G. Wilberforce, 1881, *et seq.*

**WILBYE, JOHN**, usually considered the prince of English madrigal writers, flourished at the close of the sixteenth and beginning of the seventeenth centuries. Of the composer of "Flora gave me fairest flowers," "Sweet honeysucking bees," and many other immortal works, all we know is that his first set of "English madrigals to



three, four, five, and six voices" was dated from "the Augustine Fryers" and published in 1598, his second set "apt for voyals (viols) and voyces" in 1609, and that he was a lutenist and a teacher of music. One would willingly know more of one of our foremost early native composers.

**WILDBAD**, a small watering-place of Germany, in Württemberg, in Schwazywald, situated on the Enz, 29 miles west of Stuttgart, 1444 feet above sea-level. It is only worth mention for its natural baths. The hot waters are considered beneficial for rheumatism, gout, stiffness of the limbs after wounds or fractures, paralysis, and also for some diseases of the skin.

The thermal waters of Wildbad are nearly pure; their principal chemical ingredient is common salt. The mean temperature of the different baths varies from 26° to 30° Réaumur (= 90° to 100° Fahr.)

**WILHEM, GUILLAUME LOUIS BOCQUILLON**, the excellent musical reformer, was born in Paris in 1781, and died in 1842. His enthusiasm for the promotion of a knowledge of music among the common people led the restored government of 1815 to appoint him director-general of music in the Paris schools (1818). Wilhem was not content with this, but developed his organization into the vast scheme of the "Orphéon" (1835), whose members (orphéonistes) have covered France with 1500 affiliated societies, containing 60,000 or 70,000 singers, and come the nearest to our great English co-ordinated choral efforts, such as the Handel Festival Choir, &c., though the music they sing is far simpler.

The system used by Wilhem was carried out largely by mutual instruction, and the method was based upon the use of the *fixed Do*, where *Do* means always the note we call *C* with 528 vibrations per second (or a multiple or fraction of that by some power of 2); in direct conflict with the principles of Chévé and of the Tonic Sol-fa methods, which are based on a *movable Do*, where *Do* means the keynote, whatever name and number of vibrations per second it may have in the regular musical system. Hullah unfortunately became a blind partisan of this method of Wilhem, and much marred his own excellent work in consequence.

Wilhem's system, both of musical nomenclature and of class instruction, has long since died out; but his zeal and his real genius and devotion to his life-work have produced undying results.

**WILL.** See **WE.**

**WILKES, JOHN**, an English politician, born in London, 17th October, 1727, died there, 27th December, 1797. He was the son of a rich distiller, and was educated at Hertford and Aylesbury, and afterward studied at Leyden. In 1719 he married a Miss Mead, an heiress ten years older than himself, from whom, after the birth of a daughter, he was separated, with a scandal very damaging to his character. In 1757 he entered Parliament, and in 1762 started the *North Briton* newspaper for the purpose of assailing the administration of Lord Bute. After that minister's downfall, the *North Briton* continued its attacks upon the government, Wilkes being aided, it is said, by Lord Temple and the poet Churchill. The king's speech at the close of Parliament in 1763 claimed for Great Britain the merit of the peace closing the Seven Years' War. The *North Briton* charged the monarch with falsehood. Wilkes was arrested and committed to the Tower, but in a few days was discharged by means of a writ of *habeas corpus*, on the plea of his privilege as member of Parliament. The House of Commons at the next session, however, declared the paper in question to be a seditious libel, ordered it to be burned, and passed a special law for the author's prosecution. The populace took up the side of Wilkes, and when the attempt was made to burn the obnoxious number a riot ensued. Wilkes also won his suit against the under-secretary of state for the seizure of his papers, the

jury giving him £1000 damages. In January, 1764, he was expelled from the House of Commons; and the Upper House having accused him of writing an obscene poem called an "Essay on Woman," he was tried before Lord Mansfield and found guilty, and, as he had fled to France, was outlawed. He returned to England four years afterwards, and was again elected to parliament from Middlesex. He now gave himself up to the court of king's bench, but it refused to commit him. Having been at once rearrested, he was rescued from the officers by the mob, but voluntarily went into confinement. On the day when Parliament met, a large crowd assembled in front of his prison to conduct him to the House of Commons. A riot followed, and several of the mob were shot by the military. The sentence of outlawry was reversed by Lord Mansfield; but Wilkes was convicted of two libels, fined £1000, and sentenced to twenty-two months' imprisonment. Having charged Lord Weymouth with planning "the horrid massacre in St. George's fields," as the quelling of the riot was called, he was again expelled from Parliament, and a new election was ordered for Middlesex. Wilkes was returned without opposition, but the House declared him incapable of sitting. Three other elections had the same result, and at last the Commons declared his opponent Colonel Luttrell elected, on the ground that the votes cast for Wilkes were void. Wilkes, though in prison, now became the most popular man in England. His contest with the ministry was regarded as one for the preservation of the rights of the people. Costly presents were sent him, and £20,000 was raised to pay his debts. In November, 1769, a jury gave him £4000 damages against Lord Halifax for false imprisonment. In April, 1770, he was set at liberty and elected alderman of London. He was twice commanded to attend at the bar of the House to answer for his conduct in that office, but refused to appear except as member for Middlesex. The House finally evaded the contest by summoning him to appear on 8th April and adjourning to the 9th. In 1771 Wilkes was elected sheriff of London, and in 1774 lord mayor; and in the latter year he was again elected to Parliament for Middlesex and took his seat. From 1779 till his death he was chamberlain of London. In 1782 he succeeded in procuring the expunging of the resolutions of expulsion from the records, on the ground that they were subversive of the rights of electors. He published translations and editions of several classics. His "Letters to his Daughter" from 1771-96 were printed in 1804; and in 1805 Almon published his correspondence in five volumes, with a biography. Wilkes was tall and thin in person, had a sallow complexion and very decided squint. In his life he was shamelessly immoral, but his manners were charming, and his wit was prompt, sparkling, and abundant. See "Biographies of John Wilkes and William Cobbett," by the Rev. John Watson (London, 1870), and "Wilkes, Sheridan, and Fox: the Opposition under George the Third," by W. F. Rae (London, 1874).

**WILKIE, SIR DAVID**, the chief of British genre painters, was born at the manse of the parish of Culter, in Fifeshire, of which his father was minister, 18th November, 1785. He received some education at the school of Pittlessie, and at the grammar-school of Kettle; but paid little attention to anything except drawing. The bent of his mind being uncontrollable, he was sent, in 1793, to the Trustees' Academy of Edinburgh for the Encouragement of Manufactures. In 1803 he won the ten-guinea premium that was awarded in that year, for the best painting of "Calisto in the bath of Diana." In 1804 he left the academy, and returned home, where he painted many portraits in small and in miniature, and the "Village Recruit," which he took with him to London, and sold for £6. Wilkie lost no time in obtaining admission as a student at the Royal Academy. His first patron in London was Stodart, the pianoforte-maker, who sat for his

portrait, ordered him to paint two pictures, and introduced him to a valuable connection. The Earl of Mansfield now commissioned him to paint a picture from his sketch of the "Village Politicians;" but though it met with general admiration, the liberal patron demurred at giving thirty guineas for it. But Mansfield's meanness could not prevent the genius of the painter from becoming known. Wilkie became the lion of the day, and commissions crowded in upon him. "The Blind Fiddler," "Alfred in the Neat-herd's Cottage," the "Card Players," and the "Rent Day," were painted in 1807 and 1808. "The Ale-house Door," afterwards called the "Village Festival," was painted for Mr. Angerstein for 800 guineas, and is now in the National Gallery. The "Village Politicians" is also a work of this period. In 1809 Wilkie was elected A.R.A., and R.A. in 1811. In 1811 he went with his friend Haydon to Paris, where he was especially struck with the pictures of Ostade and Terburg. In 1811 and 1815 he painted "Distraint for Rent," the "Pedlar," and the "Rabbit on the Wall." In the summer of 1816 he travelled with Raimbach, the engraver, in Holland and Belgium. After a visit to Scotland, he commenced in 1819 his picture of the "Reading of the Will," for the late King of Bavaria, which he finished in the following year. In 1821 he finished his "Chelsea Pensioners." This picture, painted for the Duke of Wellington for 1200 guineas, is certainly his masterpiece. (The famous "Penny Wedding" may however perhaps dispute the title, with many admirers of Wilkie.) In 1825 he set out with one or two friends on a continental tour, and during an absence of three years he visited the principal places in France, Spain, Germany, and Italy. After the death of Sir Thomas Lawrence, in 1830, he was appointed painter-in-ordinary to his Majesty. He had now changed his style completely for that of high Italian art, but while he lost his own distinctive excellencies he did not live long enough to gain a mastery over his new method. His "John Knox Preaching," which is in the National Gallery, is perhaps the best of the later works, but they are usually regarded with little interest, while his own natural art is more admired than ever. In 1836 he was knighted by William IV. In the autumn of 1840 Sir David set out on a tour to the East. He was taken ill on the voyage home, and died 1st June, 1841, off Gibraltar.

**WILKINS, JOHN, D.D.**, Bishop of Chester, was born at Fawley, near Daventry, in 1611, in the house of his maternal grandfather, John Dod, who was a nonconformist of some note. He graduated at Oxford, becoming M.A. in 1631. He had early addicted himself to mathematical and physical studies, and it was his proficiency in these that chiefly recommended him to the Count Palatine of the Rhine, whose chaplain he became. His early publications were all upon such subjects, and are interesting and valuable memorials of the state of science in that age. His first work appeared in 1638 under the startling title of "Discovery of a New World; or a discourse tending to prove that it is probable that there may be another habitable world in the moon, with a discourse concerning the possibility of a passage thither." In 1640 he published a "Discourse concerning a New Planet, tending to prove that it is probable our earth is one of the planets." When the troubles of Charles I.'s reign began he sided with the Parliament, and publicly professed himself of the Presbyterian party by signing the Solemn League and Covenant. In 1648 the committee of Parliament appointed him warden of Wadham College. While resident in London as a chaplain, he had been extremely active in promoting those scientific meetings which ultimately led to the foundation of the Royal Society; and as warden of Wadham he continued to stimulate the study of experimental and mathematical science in the same way. In 1656 he married a sister of Oliver Cromwell, and in 1659 he was nominated by Richard Cromwell to the mastership of Trinity College,

Cambridge. In 1660 the Restoration unsentimental him from this high academic dignity, and for some time his fortunes were reduced to a low ebb. But he found a new patron ere long in the Society of Gray's Inn, who made him their chaplain; and in 1662, having made up his mind to conform to the conditions of the Act of Uniformity, he was presented to the rectory of St. Lawrence, Jewry, which was in the gift of the crown. He took a prominent part in founding the Royal Society, was elected a member of its first council, and gave a new proof of his scientific genius by preparing an "Essay towards a real Character and a Philosophical Language" (*i.e.* shorthand and a universal language), which he gave to the world in 1668. In the same year he was made bishop of Chester, after having been for some time dean of Ripon. As such he is mentioned with high honour by Bishop Burnet in the "History of his Own Times." But he did not long enjoy his new honours; he died 19th November, 1672, in the house of Dr. Tillotson, in Chancery Lane, and was interred in the Church of St. Lawrence, Jewry. On most of the subjects which engaged his truly original and suggestive mind he was a man much in advance of his own age, and it may be mentioned as a signal instance of this in the theological field, that there are not a few thoughts in his posthumous "Discourse on Natural Religion," which anticipated the masterly argument of the "Analogy" of Bishop Butler.

**WILKINSON, SIR JOHN GARDNER**, the eminent Egyptologist, was the son of the late Rev. John Wilkinson, and was born in October, 1797. Left an orphan early, he was sent to Harrow and Exeter College, Oxford. On leaving Oxford he gratified his love of travel, in which he had already indulged during long vacations, and made a tour in Italy, where he formed an intimacy with Sir William Gell, by whom he was invited to an examination of the monuments of Egypt. In 1821 he went to Egypt, and remained there for twelve years. His first work, the "Materia Hieroglyphica," containing the Egyptian Pantheon and the succession of the Pharaohs, was printed at Malta in 1828, and was followed in 1833 by his "Topography of Thebes, and general view of Egypt." The first series of his great work, the "Manners and Customs of the Ancient Egyptians," appeared in 1837, and it was completed in 1841 by the publication of a second series in two volumes. In 1839 he was knighted for his contributions to so interesting a section of knowledge. He afterwards visited Egypt four times. He wrote much on Egyptian subjects, and all his works are extremely valuable and interesting. He was well aware of the importance of copious illustrations. He afterwards directed his attention to Celtic remains in Britain, and wrote several papers on the subject. His extensive collection of Egyptian, Greek, and other antiquities, he gave to the governor of Harrow School to found a museum, and in 1874 he presented it with his collection of coins. He died in October, 1875.

**WILL**, in law, the written instrument wherein a man declares his wishes in respect to the disposition of his property after his death. There is good reason to believe that the right of inheritance, or of descent to the children or kindred of the deceased, was firmly established and allowed earlier than the right of disposition by will. Blackstone says that until "modern times" a man could only dispose of one-third of his personal property away from his wife and children, and, in general, no will of lands was permitted until the reign of Henry VIII. But it seems to have been the law in those early ages that a man's "goods," or, as we now call it, his personal property, was divided at his death, if he left a wife and children, into three parts, his wife taking one, his children jointly one, and the third being at his disposal by his will or testament. If he left a wife and no child, she took one half, and he could dispose of the other; and if he left a child

or children, but no wife, they took one half, and he could dispose of the other; and if he left neither wife nor child, he could dispose of the whole. If he died intestate, the king, as *parvus patriæ*, took possession of his personals.

Formerly, also, a verbal or *nuncupative* will was, under certain circumstances, valid regarding personal property, but by the 1 Vict. c. 26 all verbal wills subsequent to 31st December, 1837, were made void, except those of soldiers and sailors on service. By the same Act also, it is enacted that it shall be lawful for every person to devise, bequeath, and dispose of, by his will, executed as required by that Act, all real and personal estate which he shall be entitled to either at law or in equity at the time of his death.

It is also ordained that where testators have omitted the use of strictly legal phrases, the will shall nevertheless be valid. A special Act, indeed (15 & 16 Vict. c. 24), was passed to prevent the possibility of an error in the place of signature, even by the most ignorant; all the most unusual places of signature—the beginning, the middle, the margin, the back, &c.—were declared equally valid. But in order to avoid disputes and litigation after the death of the testator, he should take care to place his signature at the foot or end of the will, and to do so in the presence of two witnesses, who should sign their names and places of abode at the time and in the presence of the testator. No seal is now required to a will. Persons under twenty-one years of age cannot make a valid will, nor can the validity of a will be established if it is made by an idiot, lunatic, a person in dotage, a felon, or an outlaw. A will made under intoxication is void, unless it is subsequently acquiesced in by the testator.

No especial form of words is necessary to constitute a will or a legacy. It is always enough if the language used, however unusual or ungrammatical, convey with distinctness the intention and desire of the testator. Where, however, a testator uses technical words he is presumed to *know* of them in their legal sense.

Those who wish to make their wills now without the interference of lawyers, should avoid the use of forms, however easy or comprehensive, and use only language dictated by the ordinary judgment and perspicacity of business. The most complete instructions as to making a safe will are contained in these few words: write your wishes as to the disposal of your property briefly in your own terms, on paper, and let it be signed by yourself and two witnesses in each other's presence. At the same time, where the estate is of any value, and where several interests are involved, it is always best to seek professional aid, and to have a will drawn up in accordance with legal custom.

**DOCTOR'S COMMONS** was formerly the great repository for wills, but they were removed to Somerset House in 1875. Here also the wills of living persons may, on payment of a fee of 12s. 6d., be deposited for safe keeping until the death of the testators render them operative. The will of Shakespeare and the wills of many other distinguished persons are deposited here, and may be seen by visitors properly introduced. Any ordinary will can be seen on payment of a fee of 1s. See also **EXECUTOR, DESCENT, HEIR, INTESTACY, and LEGACY.**

**WILL, THE**, that one of the three great departments of **MIND** which covers all the sphere of action, the other two departments being **INTELLECT** and **FEELING**. (Therefore under Will we formally include even those automatic movements which are scarcely to be called voluntary.)

Voluntary action presupposes either Sensation or Emotion, the two branches of Feeling, and this Feeling must be guided by Intellect. Thus a child sees an apple (sensation), thinks of its pleasure-giving properties (intellect), and at once desires it (will), probably therefore stretching out his hand for it (action). Desire thus is seen to be the fundamental element in volition, and to demand a representation of some pleasure, due probably to memory or

imagination; that is, to demand as its roots a combination of intellect and feeling. But desire (or *motive*) may not blossom into action, the complete form of will; for this there needs the representation of some appropriate action (or *means*) necessary to obtain the desire, again only possible (as the end) by help of memory or imagination—that is, by the co-operation of intellect and feeling.

The will, besides its quality as an active power, may be stimulated to the attitude we call "attention," and thus we get the essential difference between the external will marking the man of action, and the internal will marking the man of thought. Not only are these two phases distinct, they are even contrasted. Those who are perpetually in action commonly lose much of the power of concentrated thought, and *vice versa*. The great Newton, absorbed in thought, was once found at dinner-time still only half-way through the act of drawing on his stocking, the point where an absorbing mental process had begun before breakfast-time. The power of action could not be more markedly suspended. On the other hand, men of enormous active powers and force of external will, such as Napoleon, begin by dominating their own emotions, but they too often end, as in his case, by blunting every pure feeling and unselfish emotion that distinguishes the civilized man from the brutal savage.

Voluntary movement must begin by chance, spontaneous or automatic movements, such as we see arising from mere energy or from reflex stimulus in very young babes. These movements which bring pleasurable results (feeling) increase the vital force, and are remembered (intellect) or are continued for the sake of repeating or continuing the pleasure. The "word of command" is learned later on; that is to say, the child is trained by its parent to associate a verbal suggestion with certain movements, so that the action responds to this external *will*, as readily as to the internal will of the child itself. To train this side of will is one of the great aims of the **KINDERGARTEN**. The chief result is the real comprehension of language, and eventually the power to use language to influence the wills of others. The moral results need not here be touched upon. A subordinate but most valuable result is the perfect attainment of command over the bodily organs, so that desire is properly able to be carried into action. Further, a very important result of such training is the formation of habit, the backbone of character. Good habits are not difficult of acquirement, and are firmly persistent when acquired, and make life easy and pleasurable; evil habits are also easy to learn, but terribly hard to unlearn, and make life a never-ending curse to oneself and others. How important becomes the task of the educator from this point of view! and how unspeakably anxious the parental office to one who is thoughtful enough to measure its responsibilities!

The full development of the will is attained when, by the help of imagination and thought, distant, abstract, or altruistic ends can be set before us as objects to be attained; when the aim of one's whole life, the pursuit of virtue, or the benefit of one's fellow-men can be settled as motives to actuate us and to be definitely striven for; and when we sometimes in that noble strife come to dimly feel as if we were in our humble way actually aiding in the process of the perpetual evolution of the divine scheme of the world. On the other hand, men are never wanting to deny the possibility that we are so able, and to assert that we are but the sport of circumstances. This subject, however, is fully discussed elsewhere, in the article on the **FREEDOM OF THE WILL.**

**WILL O' THE WISP** (or *Kitty with a wisp*, or *Jack-a-lantern*). See **IGNIS FATUUS.**

**WIL'LAERT, ADRIAN**, the founder of the Venetian school of music, was, like most of the pioneers of Italian music, a Netherlander. He was born near Courtrai, in

Flanders, in 1480, sent to Paris to study law, turned student of music instead, under Jean Mouton and the great Josquin des Prés, and eventually went to Italy, under Leo X. After holding several various appointments he settled down at Venice, under the great republic (1527), and there founded the great singing school which turned out so many mediæval musicians of the highest rank. His greatest personal pupils were Zarlino and Cyprian Van Roor (or De Rore), the latter being his successor as chapel-master at St. Mark's. He died at Venice 1562.

Willært's compositions are numerous, and consist of many books of motets, madrigals, psalms, &c. His special invention of double choruses was suggested by the two organ lofts at St. Mark's, the rich effects of this simple device being seized upon by him with the intuition of genius. One of his motets tells the whole story of Susannah, and is fairly claimed by his admirers as the germ of the oratorio style; another title given him, with still better cause, is that of the "father of the madrigal."

**WILLIAM I.** of England, surnamed *the Conqueror*, was the descendant of Rollo, a renowned sea-king who flourished at the beginning of the tenth century, and having been expelled from Norway, succeeded by his enterprise and valour in establishing himself in that province of France which in course of time came to bear the name of Normandy. William was the illegitimate son of Duke Robert the Magnificent (the fourth in descent from the respectable ancestor of the Normans), by Arletta, the daughter of a tanner of Falaise. He was born in 1027. Robert was married to the sister of King Cnut of England, but had no legitimate children; and when, in 1035, he departed on a pilgrimage to the Holy Land, he persuaded his barons to swear allegiance to young William as the successor to his dominions. The duke died in the course of the same year while returning from Palestine, and though his son was only eight years of age he was at once placed upon the dual throne. During his minority the turbulence of the Norman barons, and the aggressions of the French king on the independence and rights of the duchy, reduced Normandy to a perilous state of anarchy and weakness. But as soon as the young prince came to maturity he set himself vigorously to suppress internal disturbances and to repel foreign invasion; and by his combined courage and sagacity succeeded in making himself respected and feared by all the neighbouring princes, and established a degree of order in his duchy which was unknown at that time in the rest of Europe. The English throne was at this period filled by Edward the Confessor, who was the grandson of one of the dukes of Normandy, and was far more Norman than English in his education and tastes. He had no children, and William, who was the grand-nephew of the Confessor's mother, seems at an early stage to have entertained the hope that he might succeed to the English throne. In 1051 he paid a friendly visit to his kinsman, Edward, who received him with great honour, and, as it is alleged, hinted to him before his departure his intention of adopting him as his heir. Harold, the king's brother-in-law, and the most powerful nobleman in England, was William's only serious rival. In 1065 Harold was shipwrecked on the territory of Guy, count of Ponthieu, who demanded an exorbitant sum for his ransom. He was rescued, however, by the interposition of William, who conducted him to his court, and having treated him with every demonstration of respect, disclosed to him his pretensions to the English throne, and solicited his assistance. Harold, feeling that he was completely in the power of his rival, signed compliance with his request, and even took a solemn oath over a casket of relics that he would fulfil his promise.

On the death of King Edward, however (5th January, 1066), Harold was at once unanimously elected king. William prepared to assert his claims by the sword. As

soon as his design was made known, there flocked to his standard great numbers of daring adventurers from all the neighbouring countries, in search of fortune or renown; and with the special blessing of the Pope and the most remarkable and formidable armament which the western nations had witnessed, he put to sea, and landed at Pevensey Bay, on the coast of Sussex, 28th September, 1066. Harold, who three days before had gained a bloody but decisive victory at Stamford Bridge over his brother Tostig and the King of Norway, hastened to the south to repel this new invader. The great battle which decided the destiny of England was fought at Senlac, near Hastings, on the 14th of October. The combat, which lasted nine hours, was maintained on both sides with desperate valour and with varying success. William had three horses killed under him, and then continued the contest on foot. At length the English were tempted by a pretended flight to issue from their stockades, and their line was broken; and a little before sunset Harold, who had displayed equal courage and skill, was killed by an arrow which pierced his brain, and his fall decided the fortune of the day. Making himself master of Dover, in order that he might secure a retreat in case of failure, William marched on the metropolis. His approach put an end to some feeble and irresolute attempts, on the part of a few of the great thanes and the Londoners, to support the rights of Edgar the Atheling, grandson of King Edmund the Ironside. The bishops and other ecclesiastical dignitaries, who were for the most part Normans, and influenced by the Pope's bull issued in favour of William, were the first to make their submission. Their example was soon followed by the nobility, Edgar the Atheling among them, and on Christmas Day, 1066, William was formally elected and crowned in Westminster Abbey. During the performance of the ceremony an alarming tumult broke out, caused by his troops setting fire to the houses. It was the interest of William to propitiate the affections of his new subjects, and at first his rule was comparatively mild; but the insolence and oppression of his Norman barons, into whose hands he had committed the principal strongholds and towns of the kingdom, roused the proud and independent spirit of the Saxons, and during the absence of William in Normandy various local risings took place, especially in Devonshire and Cornwall. William hurried back to England about the close of 1067, and speedily crushed, and severely punished the insurgents. During 1068 he made a campaign into the north, and partly by voluntary submission, partly as the result of war, he received the submission of all the country. His conquest of 1068 was far greater in extent than that of 1066-67. In 1068 also his son Henry was born, whom the English therefore could reasonably regard as an Atheling, and whom William determined to bring up as an Englishman in every way. William assumed the old folk-land or common land as crown property, thus definitely organizing a system which had been gradually transferring this large domain from the control of the witan or council to that of the king alone. Further, he confirmed readily all Englishmen who made their peace with him in their lands, some freely, some by payment; those who resisted him were replaced by Norman barons. The folk-land he sold or granted to his followers to reward them. It was evident that England was no longer to be for the English; therefore, in 1069, a determined series of revolts occurred. In the north William's garrisons at York and Durham were defeated and destroyed by the enraged citizens. A powerful Danish armament arrived in the Humber to help the English, and was joined by Edgar the Atheling and crowds of the Saxon nobles and people. The military genius of the Conqueror, and the valour and discipline of his troops, triumphed over all opposition; but William, irritated by these repeated insurrections, in a transport of passion swore to extirpate the people of Northumbria. "From York to

Durham," says William of Malmesbury, sixty years after the event, "not one inhabited village remained; fire, slaughter, and desolation made it a vast desert, which continues to this day." These atrocities have left an indelible stain on the memory of William, but his stern remorseless policy had the effect of putting down all opposition to his authority. Another charge against his memory is that of several acts of cruel dispossession, caused by his resolve to enlarge the hunting forest near his capital of Winchester, which he called the New Forest. He did not go the length that old writers were fond of asserting, but he was undoubtedly reckless in its formation. The sternly enforced order to put out fires at the ringing of curfew (*Fr. couvre-feu*) is also enlarged upon as a piece of cruelty; but this is the height of absurdity. In the first place it was a valuable protection against fire, most houses being of wood, and in the second place it was already customary in many places, and the king was far-sighted enough to see its use and make it general and compulsory. Although the reign of William introduced a foreign monarchy and a foreign nobility, and caused much misery to the people, it would be unjust not to admit that it was also productive of great and permanent good to the country. While, on the one hand, he maintained strict order and internal peace, on the other he put an end to the ravages of the piratical Norsemen, who had infested the coasts of England for more than two centuries. He effected various important judicial improvements, separated the ecclesiastical from the civil judicature, retained, though with important modifications, the Saxon popular tribunals, and introduced and organized the feudal system in such a way as to repress the turbulence and lawless violence of the nobility. It is to this great king also that we owe that invaluable survey of all England, save Northumberland, called *Dome-day Book*, a possession not rivalled by any other nation. The closing years of William's reign were disturbed by a violent quarrel with his eldest son, Robert, to whom he had promised the duchy of Normandy. He now refused to fulfil these engagements, alleging that "he never intended to throw off his clothes till he went to bed." Robert flew to arms, was of course defeated by William, the foremost general of the age, and took refuge in the Castle of Gerberoi, where he was besieged by his father. In one of the encounters which took place outside the fortress, Robert unhorsed and wounded the old king, whom he did not recognize until he called out for assistance. The prince, struck with remorse, threw himself at his father's feet, and entreated his forgiveness, and a reconciliation was finally effected through the tears and entreaties of Matilda the queen. In 1086 all the principal landowners were assembled at Salisbury, and swore direct feudal homage to the king, a very important and beneficial alteration of the continental feudal practice.

In 1087 a misunderstanding arose between William and Philip, king of France. William led an army towards Paris, and laid waste the country; but while riding among the smouldering ruins of the town of Mantes, which he had ordered to be burned, his horse reared and plunged so violently as to bruise the belly of his rider, who was at this time very corpulent and unwieldy. He was carried to the monastery of St. Gervase, near Rouen, where he breathed his last on the 9th of September, in the sixty-third year of his age and twenty-first of his reign. He left three sons—Robert, to whom he bequeathed Normandy and Maine; William Rufus, who succeeded him on the throne of England; and Henry, who inherited the possessions of his mother, and subsequently the English crown. William was a brave and skilful soldier, and a vigorous and sagacious ruler, a thoroughly great and noble king, much of whose cruelty was forced upon him. As a contemporary chronicler says, "He was more worshipful and strong than any of his fore-gangers. He was mild to good men who loved God, and stark beyond all bounds to those who withstood his will.

A splendid account of William's whole career is to be found in Professor Freeman's "*Norman Conquest*," a book which has made an era in English scholarship.

WILLIAM II., King of England, surnamed *Rufus* (the Red), was born in Normandy in 1057. He was the second son of William the Conqueror, and succeeded his father on the throne by virtue of his will, to the exclusion of the Conqueror's eldest son Robert, being crowned by Archbishop Lanfranc, at Westminster on the 26th of September, 1087. His uncles—Odo, bishop of Bayeux, and the Earl of Mortaigne—rebelled against him almost at once, and were assisted by Robert; but the Red King soon crushed the rising. The next few years were passed in making attacks, and even more dangerous intrigues, upon Normandy, in repelling incursions of the Scots, in one of which Malcolm, king of Scotland, lost his life, and in domestic petty wars with the turbulent baronage. In 1094 the First Crusade commenced, in compliance with the preaching of Peter the Hermit; and Robert mortgaged Normandy to William for five years in order to raise funds to enable him to join in the holy expedition. In 1097 Magnus, king of Norway, landed with his forces on the Isle of Anglesey, but was repulsed by Hugh de Montgomery, earl of Shrewsbury. William's schemes were suddenly frustrated, for on the 1st, or according to William of Malmesbury, on the 2nd of August, in the year 1100, some colliers passing through the New Forest, near Minstead, found his dead body lying on the ground with an arrow fixed in his breast. They conveyed it on the following day to Winchester in their cart, and it was buried in the cathedral there. The common story of the king's death is, that a French knight named Walter Tyrell, shot at a stag, but that the arrow hit a tree, from which it glanced and mortally wounded William. Professor Freeman, in his exhaustive work on the reign ("William Rufus," 1887), gives every possible piece of evidence, and concludes that the real truth can never be known. William built a wall round the Tower of London, and erected the original Westminster Hall for a banqueting room. Parts of the Norman work (on the north side) yet remain.

The reign of Rufus is a time of transition, a period of confused aims and shifting policy, in which no single great event or series of events stand forth as the absorbing centre of interest. It falls between the establishment of the Norman rule in England under William the Conqueror and the complete establishment of the monarchy under Henry I. Certainly the most important thing about it is the quarrel with Archbishop Anselm. The matters in dispute were trivial, but they soon brought out the principle of papal authority against regal authority in all church matters, and this was the beginning of a strife which was not settled until the Reformation. As to the character of the Red King himself, he was a man stained by almost every vice hateful to God and man, blasphemous, rapacious, violent, lustful, perfidious, yet with some redeeming points which make us feel that he was human, and had a side on which men might like, and even in a fashion respect, him. He had a certain kindness for his friends. He scrupulously kept his knightly word. Mr. Freeman shows ingeniously from this extreme case how the artificial code of knightly honour might exist in and control the most depraved minds, and how, with all its unreality, it was better than no code at all. And he has never done anything more skilful in the way of historical portraiture than in setting before us side by side the fierce energy of William Rufus and the saintly calm of Anselm.

WILLIAM III. William Henry, Prince of Orange and Nassau, who reigned as William III. of England, was the posthumous son of William, prince of Orange, by Mary, eldest daughter of Charles I., and was born at the Hague on the 14th of November, 1650.

In the childhood of the Prince of Orange Spain sank

from pre-eminence in Europe, and France, under Richelieu and Louis XIV., took her place. As a youth he saw the sudden seizure of Flanders by Louis and the hurried signature of the Triple Alliance (England, Holland, and Sweden) against the great foe of liberty (1667). As a man he saw France gather herself together in her rage, and with the unheard-of force of 180,000 men dash herself upon presumptuous Holland. De Witt fell from power as the French crossed the border (1672), and the glare of the French watchfires was seen from Amsterdam. William at once sprang to the front. His fatherless, friendless childhood, spent among the perpetual watch of men who viewed his life as a danger to the state, had made him self-contained and cold. He was weak and sickly from his eradic, and already gave signs of asthma, and was racked by a hollow consumptive cough; his sullen bloodless face was marked with lines of pain. No one yet suspected his fiery ambitious temper, his immovable courage, and his immense political ability. Holland, crushed and hopeless, stirred at his first address as Stadtholder, rose to her feet, learned to believe in him as he won back town by town from the invader. Yet no man was more often defeated—the remarkable thing about William being that he absolutely profited by almost every defeat. The veteran Coudé was amazed to see the squadrons he had broken at Seneff rallied under his eyes, and the fruits of his victory wrested from him by a youth of twenty-two. At such moments alone William was not cold; his eye flashed, his voice rang gaily, a retreat became a strategic movement of marvellous result. The peace of Nimeguen gave him time to breathe in 1679. The hero had been rewarded 4th November, 1677, by the hand of his cousin, the excellent Mary, who lives yet with us by those simple pious letters which were happily published in our own days, a short time since (1885). Mary Stuart was, like William, the grandchild of Charles I. She was the elder daughter of James, duke of York, and as Charles II. was childless, stood next her father in the English succession. In the troubles about the Exclusion Bill the cause of James was adopted by William, and it was the confidence of the English in his sturdy Protestantism that permitted this Bill to drop and the Catholic James to ascend the throne (1685).

But James II. renewed his brother's secret treaty with France, and plunged into that well-known quarrel with his people which cost him his crown. He thought to carry William with him when he proposed to abolish the Test Act, but the Prince at once refused. "You ask me to countenance an attack upon my religion. That I cannot do!" England looked more and more across the sea for a deliverer, and all men openly rejoiced when both William and Mary addressed a firm yet temperate protest to James upon his illegal and tyrannical "Declaration of Indulgence" (1687). James saw that if he succeeded in establishing Roman Catholicism, William and Mary would overturn it at his death, and he desperately turned to Ireland as a place of Catholic refuge. Every Englishman was turned out of office, and in a few months the very lives of the English were at stake. The Irish began to show their face; 1500 Protestant families fled to England and the rest armed to resist their fate. Panic reigned supreme. William saw the moment had come for action if his wife were not to lose part of her dominions; and he agreed to receive the plans of the rapidly growing body of disaffected nobles. Still, however, he shrank from armed intervention, and steadily counselled patience, as we can still see in his voluminous English correspondence.

At last the news of the queen, James's second wife, being with child, forced on the long-impending crisis. The great nobles of England signed an invitation to William to come in arms and restore legal government, which meant (so bad had things become) the absolute reversal of all James's acts. William gathered forces rapidly and secretly, and

Englishman after Englishman from almost all the noble houses arrived at the Hague. Then came the birth of a Prince, which half England believed (wrongly) to be an utter imposture, and the scandalous trial of the seven bishops. One thing restrained William; France was threatening war. But by the greatest error of his reign Louis XIV. advanced on Germany, not Holland. The states-general at once agreed to William's English enterprise, and the armament assembled in the Scheldt (September, 1688).

James now attempted to repair his follies, dissolved his Ecclesiastical Commission, restored his banished magistrates, sent the confiscated charters to London and the other towns, and even condescended to prove the birth of his child. But William's fleet of 600 transports and 50 warships, hindered at first by a storm, came to land at last on the 5th of November, 1688, in Torbay, and he entered Exeter at the head of 13,000 men. His march was a triumphal procession, and James abandoned the struggle in despair. He fled in disguise, was brought back to London, was allowed to escape again by the connivance of William (23rd December), and never saw England more. He flung the great seal into the river and burned the writs for the new Parliament, as well as doing every other thing he could think of to make government difficult. For a few days London was a scene of wild disorder and mob-law, but the instincts of the English people soon asserted themselves, a few nobles assumed authority as privy councillors, and handed over a fairly quiet city to William upon his arrival. The House of Peers was summoned, and a second House made of all the Commons who had sat during the reign of Charles II. together with the aldermen and common council of London. This body summoned a Convention in the usual parliamentary way. It met in January, 1689. The Commons voted the throne vacant, but the Lords were for a regency. William at once refused to be "his wife's gentleman-usher," and Mary refused to accept the crown unless her husband were also king. The Lords gave way, and William and Mary were proclaimed joint sovereigns, the administration being vested solely in William. Somers drew up a Declaration of Rights, which is the basis of all our present government, and which the sovereigns at once accepted, 13th February, 1689. They were crowned at Westminster on 11th April.

On the 24th of March James entered Dublin with a French force; and having summoned a Parliament for the 7th of May, he proceeded to join the Irish native Catholic army in the north. The only towns that resisted him were Londonderry and Inniskillen. The former of these cities sustained a siege with the most heroic fortitude, under the governor, Major Baker, and a Protestant clergyman named George Walker, from the 20th of April till the 31st of July, when they were at length relieved. During this memorable siege, which lasted for 105 days, 3000 of the besieged and nearly 9000 of the besiegers perished. The Duke of Schomberg was sent over with 10,000 troops by William, and on the 11th June, 1690, William landed at Carrickfergus in order to conduct the war himself. On the 1st July was fought the celebrated battle of the Boyne, in which the French and Irish were totally defeated, with a loss of 1500 men, while James, now finding his hopes utterly broken, fled to France.

The year 1692 is a sad blot upon William's reign, for it is memorable for the massacre of the Highlanders of Glencoe. Their chief McDonald, who was detained by the snow from coming to take the oath of allegiance, was hated by the Earl of Breadalbane and Dalrymple of Stair. These, by misrepresentation, obtained William's consent to extirpate the McDonalds and their followers, and of the 200 men who lived in the glen thirty-eight were murdered. The rest fled, their houses and flocks were destroyed, and several of their women and children perished from want and cold.



Meanwhile James was not idle. He had collected an army composed of English, Irish, and Scotch exiles, and numbering, together with the French, nearly 20,000 men, who lay at La Hogue waiting to be conveyed to England. The English fleet was sent to oppose them, commanded by Lord Russell, Sir George Rooke, and Sir Cloudesley Shovel, and being joined by the Dutch, they gained a complete victory over the enemy (19th May, 1692). From this period to 1697 the war was carried on with various fortune on either side till the 22nd September, 1697, when a treaty was signed at Ryswick, a village lying between the Hague and Delft in Holland, by which Louis of France agreed to recognize William as the lawful sovereign of England. As the war had cost £17,000,000, Parliament resolved that all the troops raised since 1680 should be disbanded, and that the army should consist of only 10,000 men, while the ensuing year they not only voted that this number should be further reduced, but that no one but natural-born Englishmen should be allowed to serve. This resolution so irritated William, who was warmly attached to his Dutch guards, that he entertained serious intentions of abdicating; however, on the 1st of February, 1699, he gave his royal assent to the bill, and on the 18th March the foreign troops received their dismissal. On the 12th of June, 1701, as it was evident that the Princess Anne, William's future successor, would be childless, an Act was passed limiting the succession to Sophia, dowager-electress of Hanover, daughter of Elizabeth, queen of Bohemia, who was sister to Charles I., and to the heirs of her body, being Protestants.

James II. died 16th April, 1701; and on the following December it became apparent that France was preparing a new attack on England in favour of his son (the "Old Pretender," as he was afterwards called) the Chevalier de St. George. Supplies were being voted with alacrity, and the nation was exhibiting the utmost impatience to oppose the schemes of France and the Pretender, when an accident happened to the king which soon afterwards terminated fatally. On the 20th February, 1702, as he was riding from Kensington to Hampton Court, his horse stumbled with him in Bushy Park, and his collar-bone was fractured. He was conveyed to Hampton Court, where the bone was set, and returned to Kensington the same evening. For a few days no very serious consequences seemed to have arisen from his fall; but on the 14th March fever set in, and he became rapidly weaker. On the morning of the 8th the king received the sacrament from the hands of Archbishop Tenison and Bishop Burnet; and between the hours of seven and eight of the same morning he calmly breathed his last, being in the fifty-second year of his age and the fourteenth of his reign. He was buried in Henry VII.'s Chapel at Westminster, and after his death a gold ring and a locket containing his queen's hair was found fastened to his body. Queen Mary had died in 1694.

During the reign of William the first public lottery was drawn in 1694; Chelsea Hospital, which was begun in the reign of Charles II., was completed; and as a memento of the victory of La Hogue, Greenwich Palace was given up to be used as an hospital for wounded and disabled sailors. Peter the Great of Russia lodged in 1698 at the house of the celebrated John Evelyn at Deptford, where he worked as a ship carpenter. On his departure William gave him a ship, for which Peter presented him with a ruby valued at £10,000, with which the crown of England is now adorned.

**WILLIAM IV.** King of Great Britain and Ireland and of Hanover, third son of George III., was born at Buckingham House, London, on the 21st of August, 1765. Prince William Henry, as he was called, entered the navy in 1779 as a midshipman, and in 1786 received his captain's commission. Having shown a tendency to disobey

the orders of the admiralty, he was, although promoted through various stages until he became admiral of the fleet in 1801, left without active employment after 1790. In 1791 he formed his connection with Mrs. Jordan the actress; it lasted for twenty years, and produced a family of ten children, known as the Fitzclarences, and of whom the eldest son was created Earl of Munster in 1831. The prince himself was created Duke of Clarence and St. Andrews and Earl of Munster in 1789, when a provision was made for him by Parliament. A Whig from an early period, he supported the Fox-Grenville ministry of 1806, and spoke frequently (and always foolishly) in the House of Peers. When in England he resided at Bushy Park, of which he had been appointed ranger in 1797. On the 11th of July, 1818, the Duke of Clarence married the Princess Adelaide, the eldest daughter of the Duke of Saxe-Meiningen; neither of the two daughters whom she bore him surviving infancy. In 1827 he became heir-presumptive to the throne by the death of his elder brother, the Duke of York, and in April of the same year he was appointed lord high admiral under the Canning ministry, resigning office in the following autumn, after the death of its head.

The death of George IV. 26th June, 1830, raised the Duke of Clarence to the throne. Popular from the frankness of his manner and his reputation for liberalism, the successor of George IV. ascended the throne on the eve of a crisis in the history of both Europe and England. The Duke of Wellington's declaration against Parliamentary reform at the opening of the new Parliament on the 2nd of November, 1830, produced a general irritation, and on the 16th, after the defeat of the ministry on Sir Henry Parnell's motion for the revision of the civil list, the Wellington ministry resigned. The king sent for Earl Grey, and the first reform ministry was in *o. c.* In the period of political storm which followed, and which did not terminate until the June of 1832, when the Peers passed the Reform Bill by a large majority, the king had a difficult part to play. Of his sincere wish for parliamentary reform there seems no doubt; but he appears to have been alarmed by the uncompromising activity of the reformers. The ministers insisted on a creation of peers, if necessary as a last resource, sufficient in number to carry the bill. The king refused, and Lord Grey, with his colleagues, resigned. The king found it impossible to carry on the government, and had to give way and restore Lord Grey to office. The attitude of the country was menacing in the extreme, and on the 17th of May a circular was addressed at the king's command by his private secretary, Sir Herbert Taylor, to the opposition Peers, which led 100 of them to withdraw from the discussion on the Reform Bill, and thus procured the acceptance of the measure by the Upper House without recourse to a creation of peers. Thenceforth King William's sympathies were with the new Conservative opposition, slowly but surely organized by Sir Robert Peel. The posthumous memoirs of that statesman have disclosed the unsuccessful efforts made by the king after the resignation of Lord Grey and Lord Althorp in July, 1834, to bring about a coalition between Sir Robert and the moderate Conservatives on the one hand and Lord Melbourne and the moderate Liberals on the other. Alarmed at the policy of the Whigs in the matter of the Irish Church, King William watched his opportunity. Eagerly welcoming Lord Melbourne's intimations of ministerial weakness when Lord Althorp, raised to the Upper House by the death of his father, Earl Spencer, in November, 1834, could not remain chancellor of the exchequer, the king intimated to Lord Melbourne that his services were no longer required, and sent for the Duke of Wellington. The Peel-Wellington ministry fell in the April of 1835, and the king was obliged to have recourse to Lord Melbourne and the Whigs. King William died at Windsor on the 20th of June, 1837.



**WILLIAM I.** (*Wilhelm Friedrich Ludwig*), King of Prussia and Emperor of Germany, the son of Frederick William III., and of the celebrated Queen Louise, was born in Berlin, 22nd March, 1797. He early entered the army, and received his baptism of fire on 27th February, 1811, at Bar-sur-Aube, one of the battles in the campaign which ended in the overthrow of Napoleon I. After the accession of his childless brother, Frederick William IV., in 1840 he became known as heir-apparent and Prince of Prussia, was invested with the governorship of Pomerania, and in 1847 entered the United Landtag, which had been so tardily granted by the king. Chiefly on account of his fondness for the army he was regarded as an absolutist, and he became so unpopular that in March, 1848, he was sent to England to stay until the excitement in Berlin had subsided. On his return in the following June to Prussia, he was returned a deputy for the district of Wirsitz to the first national assembly. In 1849 he was sent to Baden in command of the Prussian forces, to suppress the insurrection which had arisen there, and having accomplished this, after some severe fighting, he was appointed to the governorships of Rhineland and Westphalia. He also became governor of the federal fortress of Mentz and grand-master of the Freemasons. In 1851 he was promoted to the rank of field-marshal, and from this time in all important affairs of state, both civil and military, his advice was invariably sought, though variably followed. His brother being disabled by illness in 1857, he acted in his stead by virtue of temporary decrees until October, 1858, when he was formally installed as regent, and he succeeded him as king on 2nd June, 1861. His first care was for the reorganization of the army, and this involved him in a conflict with the Liberal Chambers, which would not sanction the increased expenditure required for the scheme. For a time the representatives of the people succeeded in delaying the Reorganization Bill, and the king in his vexation at their obduracy entertained thoughts of abdication; but at this juncture Otto von Bismarck-Schönhausen came to his aid, and being appointed prime minister and minister for foreign affairs, matters took quite another turn and the Chambers found they had a master. With the assistance of Von Roon the army was rendered thoroughly efficient, and after a contemptuous dissolution of the Chambers, disaffection at home was skillfully turned by a war against Denmark over the question relating to Schleswig-Holstein. The king's sagacity in selecting able ministers and generals was equalled only by his firmness in sustaining them against all opposition; and his confidence in Bismarck, Von Roon, and Moltke was fully confirmed by the rapid and brilliant success of the war of 1866, in conjunction with Italy, against Austria. In this campaign the king took an active part, and when Austria had been extinguished as a German power, he became the head of the new North German Confederation, Schleswig-Holstein, Hanover, Hesse-Cassel, Nassau, and Frankfurt being added to his Prussian dominions. On 21st February, 1867, he opened the constituent Reichstag, and the enthusiasm of victory caused the unconstitutional conduct of the king and his prime minister to be freely forgiven. In the July of the same year he made Bismarck chancellor, and during the next ten years the king and his minister were enabled to clock without much trouble all turbulence at home, while they laboured with all their might to prepare the nation for a possible struggle with France. The South German States refused to be won over to the North German Confederation during this period, but when in 1870 the French emperor declared war against Prussia, they immediately threw in their lot with their own countrymen, and Napoleon III. found himself face to face with a united Germany. The King of Prussia at once assumed supreme command of his armies, and he shared in the fatigues and dangers

of the campaign from the outset to the end. On 2nd September, 1870, he received at Sedan the sword of Napoleon III., and on 5th October he fixed his headquarters at Versailles. Meantime the common sympathies generated among the Germans by the war were rapidly drawing the northern and southern states into union, and on 18th January, 1871, King William of Prussia was proclaimed emperor in the Hall of Mirrors at Versailles. After signing the preliminaries of peace, 26th February, he intimated to the Emperor of Russia that Germany would never forget the service rendered by his strict neutrality, a promise which was fully maintained until the death of Alexander. The treaty of peace was ratified on 1st and 2nd March, and the emperor left Versailles on the 7th, entering Berlin on the 15th, and on the 21st opening the first Reichstag of the new empire. The definite peace with France was signed at Frankfurt, 10th May, and on 9th June appeared the emperor's proclamation, incorporating Alsace-Lorraine with the empire. On 16th August, 1875, the emperor gave a further impulse to the patriotism of the nation by unveiling Bismarck's colossal monument of the national hero Arminius on the summit of the Grotenberg, near Delmold. From that time onward to the end of his life his efforts were directed towards the settlement of the internal questions troubling the nation, Ultramontanism and Socialism, and to the maintenance of peace. After a stern fight with Ultramontanism he found it necessary to compromise matters with Rome, and Socialism, though checked, repressed, and restrained, still remained a serious trouble to his government. In the maintenance of peace, the courage, promptitude, and skill of Bismarck, together with the magnificent manner in which the army was maintained in full strength and efficiency, were rewarded by success.

Like most of the sovereigns of Europe William had his life attempted on more than one occasion. The first attempt was made on 12th June, 1849, when he was on his way to Baden, and another was made in July, 1867, at Baden by a student, Oskar Becker. Again, on 11th May, 1878, a tinsmith of Leipzig named Hödel fired two shots at him while he was out driving at Berlin, and though Hödel was beheaded, a socialist named Nolling fired at and wounded the emperor on 2nd June of the same year. These acts, however, must be regarded only as the work of individual fanatics, for in spite of his want of sympathy with constitutionalism and liberty, the emperor's whole-hearted devotion to Germany, and his unquestioned zeal for the well-being of the empire as he understood it, together with his glorious military successes, and their splendid results, finally acquired for him the utmost respect and veneration of his people. The closing days of the emperor were clouded by the very grave illness of his son, and it was while the latter was at San Remo, under treatment for the disease which ultimately proved fatal, that William I. died on the 9th of March, 1888, in his ninety-first year.

The grief and veneration of the German people not only in his own dominions, but throughout the world, found expression at his funeral, which was attended by representatives of almost every German community, as well as of the chief nations of the world.

William I. married Maria Louisa Augusta Katharine, daughter of the Grand-duke of Sachsen-Weimar, on 11th June, 1829, and had by her one son, Frederick William Nicholas Charles, afterwards Frederick III., and one daughter, Louise Marie Elizabeth, married in 1856 to the Grand-duke Frederick of Baden.

The life of the emperor has been written by Schneider (fourth edition, 1866) and Weissshuhm (eighth edition, 1869). L. Schmidt has written his military history, embracing the years 1867-71, and interesting glimpses of the emperor are to be found in Prince Bismarck's "Letters" (translated by Maxse, London, 1878). See also "William I.

and the German Empire," by G. Barnett Smith, London, 1887.

**WILLIAM OF MALMESBURY** (1095-1142), one of the best of our early chroniclers. See MALMESBURY, WILLIAM OF.

**WILLIAM OF NEWBURY** (or Newborough or Newburgh), a valuable ancient chronicler (1136-1208). See NEWBURY, WILLIAM OF.

**WILLIAM OF OCCAM**, one of the greatest of the schoolmen (1270-1349). See OCCAM.

**WILLIAM OF POITIERS** was the chaplain of William of Normandy (the Conqueror, as we style him), and is one of the chief authorities for his life, and of the battle of Senlac and the Conquest. His work is called "*Gesta Willelmi*," and would be even more valuable if it were not so completely a panegyric.

**WILLIAM OF WYKEHAM**. See WYKEHAM, WILLIAM OF.

**WILLIAM THE LION**, King of Scotland, was the second son of Prince Henry, and grandson of David I. He was born about 1112, and ascended the throne on the death of his elder brother Malcolm in 1165. William began his reign by courting the friendship of Henry II., king of England; but finding that that monarch was not disposed to restore to him the county of Northumberland, he sent ambassadors to France in 1168 to negotiate an alliance with the French king—the first negotiation between Scotland and France of which we have any authentic information. In 1174, when engaged on his second incursion into the northern counties of England, he was surprised and made prisoner by a party of Yorkshire barons. He was carried to Northampton to meet Henry, and treated with wanton and indecent barbarity, and was shortly after confined in the strong fortress of Falaise in Normandy. In order to regain his liberty, William, with the consent of the Scottish barons and clergy (8th December, 1174), agreed to become the liegeman of Henry for Scotland and all his other territories, and also promised to deliver up to the English king the principal fortresses of his kingdom and a number of his nobles as securities for the performance of the treaty. He returned to his own country in the beginning of 1176, and died 4th December, 1214.

**WILLIAM THE SILENT**, Prince of Orange and Count of Nassau, the founder of the independence of the Netherlands, was born at the palace of Dillenburg, Nassau, 16th April, 1533. He was the eldest son of Count William the Elder, of Nassau, and of his second wife, Juliane von Stolberg. By the death of his childless cousin René he inherited the principality of Orange, in Provence, and extensive domains in the Low Countries. In 1555, though only in his twenty-third year, the Emperor Charles V., who had carefully trained him in the arts of diplomacy and statesmanship, intrusted him with the command of the imperial army on the French frontier.

William was naturally of a gay and lively disposition, and was called "the Silent" from the skill with which he concealed his emotions when the French king, Henry II., revealed to him the plot for the simultaneous massacre of the Protestants in France and Spain. William was resident at Paris as a hostage from Spain at this time. Though bred a Catholic he was a Lutheran at heart, and he silently resolved to thwart the execution of the scheme so far as the Low Countries were concerned.

On his return to the Netherlands he at once stood forward as the champion of the liberties of his countrymen. He protested against the increase in the number of bishoprics, against the severe edicts designed for the suppression of heresy, and, finally, against the establishment of the Inquisition, incurring by his energy and eloquence the deadly hatred of Philip II. Nevertheless, he pressed the adoption of moderate measures upon his fellow nobles, who had formed the famous confederacy

of Gueux ("Beggars"), in 1566, and sought to effect a peaceable compromise between the throne and the people. Failing in this he quietly withdrew from Brussels and retired to his own estates. He thus escaped the fate which befell Egmont and Horn, who suffered on the scaffold, 4th June, 1568; but was declared a rebel and stripped of his dignities.

To reduce the discontented provinces to submission a large Spanish force was placed under the command of the Duke of Alva, a man scarcely less distinguished for his ferocious cruelty than his military capacity. The prince immediately abandoned all hopes of a peaceful settlement, and disposing of his plate and jewels, equipped four armies for the invasion of the Netherlands (1569). At first he was completely unsuccessful; three of his armies were destroyed, and the fourth, under his own command, could not keep the field for want of supplies, but William never lost heart. He resorted to every measure. Once he even inundated the country by cutting the dykes. Such courage at last met its reward. Many victories were gained. In October, 1574, the estates of Holland placed nearly all authority in the hands of the prince. A conference with the Spanish commissioners at Breda, in March, 1575, led to no result. But in February, 1577, the new Spanish governor, Don John of Austria, issued an edict pretending to grant nearly all the demands of the patriots; but William repelled his attempts, which he had reason to believe were treacherous. He was cheered greatly amid the many reverses of this time by the arrival of splendid subsidies from Queen Elizabeth of England. Alexander Farnese, succeeding as governor on the death of Don John, gained over the Walloon provinces, when William had incurred hostility by quelling an outbreak among the Catholics, and in 1579-80 took possession of Maastricht, Mechlin, and Gemmen. Before this, however, the prince, through his brother John, had succeeded in uniting Holland, Zealand, Utrecht, Friesland, Groningen, Overijssel, and Gelderland in a league for mutual defence and assistance. This union, which is generally regarded as the foundation of the Dutch republic, was concluded at Utrecht in January, 1579; and on 26th July, 1581, the United Provinces, in an Assembly at the Hague, solemnly proclaimed their independence. The sovereignty was offered to the Duke of Anjou. Although "Father William," as he was popularly called, had the confidence of the whole people, he contented himself with the governorship of Holland and Zealand, in order not to give umbrage to France. The duke died in France in June, 1584, and before measures could be taken to appoint his successor, William of Orange was assassinated. Several attempts upon his life had been made under the influence of the reward of 25,000 crowns and a patent of nobility, offered by Philip II. of Spain since 1580 for his assassination, and once he was dangerously wounded. The task was at last undertaken by Baltazar Gérard, a Burgundian fanatic, who shot him through the body as he was leaving the dining-room (10th July, 1584). William expired a few minutes afterwards in the arms of his wife and sister. "O my God, have mercy upon my soul! O my God, have mercy upon this poor people!" were almost the last words of one of the noblest and most disinterested of the world's great heroes. Next to piety his chief characteristic was firmness. His military genius was early recognized by Charles V., and in political sagacity he had no superior. A memorial tower in his honour was inaugurated at Dillenburg, 29th June, 1875. See John Lothrop Motley's brilliant work, "*The Rise of the Dutch Republic*" (1856).

**WILLIAMS, ROGER**, the founder of the colony of Rhode Island, was born in Wales in 1599. At an early age he went to London, where he attracted the attention of Sir Edward Coke, who sent him to school at Sutton's Hospital, now the Charterhouse, from whence he passed to

Cambridge in 1623, and matriculated pensioner, 7th July, 1625. He took the degree of B.A. in January, 1627. Entering the church he became a Puritan, and finding himself in conflict with the ecclesiastical authorities, emigrated to New England, arriving in Massachusetts in 1631. Even there he did not find the freedom which he sought, and in 1635 he was driven from Salem, where he was pastor of a church, for maintaining absolute liberty of conscience, and for denying that magistrates had a right to punish for any but civil offences. In 1636 he founded the city of Providence and the colony of Rhode Island, with a constitution purely democratic, and allowing the fullest freedom in religious matters. In 1639 he became a Baptist, but soon withdrew from the small society he had formed. His history for the succeeding half century is the history of Providence and of Rhode Island. The colony was for some years a pure democracy, transacting its public business in town meetings; but in 1643 Williams was sent to England to procure a charter, with which he returned in 1644. Before his return to America he published his "Key into the Languages of America," including observations on the manners and customs of the Indian tribes, and he also published his famous treatise entitled "The Bloudy Tenet of Persecution for Cause of Conscience, discussed in a conference between Truth and Peace." He revisited England in 1651, where he became acquainted with Cromwell and Milton, and secured the confirmation of the former charter. After his return he was elected, in 1651, president of the colony, and he acted ably in this capacity until 1657. He died at Providence in April, 1683. A statue of Williams has been erected by Rhode Island in the capitol at Washington. See the "Works of Roger Williams, with a volume of letters" (six vols. fol. Providence, 1866-75), and the Memoirs by Knowles (Boston, 1833); Gamwell (Boston, 1846), and Elton (London, 1852).

**WILIAMSTOWN**, a town of Victoria, in Australia, in the county of Burke, situated on Hobson's Bay, Port Phillip, 5 miles south-west of Melbourne, of which it is the port, and with which it is connected by railway. There are commodious piers, where ships of the largest burden can lie alongside, with shipbuilding yards and a large graving-dock. The population is estimated at 12,000.

**WILLOW** (*Salix*) is a genus of plants belonging to the order SALICINEÆ. The willows are nearly related to the *POPULARS* (*Populus*), from which they are distinguished by the form of the leaves, which are always more or less lanceolate and serrated, and by the bracts of the catkins being entire. The species are very numerous, chiefly natives of the temperate parts of the northern hemisphere, and more abundant in the Old World than in America. They are deciduous trees or shrubs, varying in height from 2 or 3 inches to 60 or even 80 and 90 feet. Willows are extensively cultivated in this country as timber trees, coppice-wood, and for the purpose of making hoops and basket-work. These intended for basket-roads, hoops, poles, or timber trees, should annually ripen their shoots. Hence the colder the climate the drier should be the soil in which they are planted, on account of the necessity of ripening their wood. They grow naturally in a moist soil, and, wherever planted, should be within reach of water. All may be propagated by cuttings. Most of the species, especially the tree kinds, grow with great rapidity. The wood is white, soft, smooth, light, and durable, especially in water; it is used in shipbuilding, for making cricket bats, &c. The bark has tonic and astringent properties, due to the presence of a principle called *salicin*, and is used as a substitute for quinine. The leaves and young shoots are sometimes used on the Continent as fodder for cattle. A liquid, called *kulaf*, is prepared in the East from the male catkins of *Salix aegyptiaca*, and employed as a stimulant and carminative.

The species of *Salix* are distinguished as *sallows*, *osiers*, and *willows*. The *sallows* are trees or low shrubs, and are characterized by downy branches, and mostly obovate, gray, hoary, toothed, more or less wrinkled, and stipulate leaves, very veiny beneath. *Salix cinerea* (the gray willow) is abundant in Great Britain on banks of rivers and in moist woods, growing to a height of from 20 to 30 feet. *Salix caprea* (goat willow, or great round-leaved willow) is a native of Britain, and is distinguished early in the spring by putting forth its handsome yellow blossoms before other trees have assumed their foliage. It grows to a height of from 15 to 30 feet, and has spreading brown or purplish branches, and leaves larger and broader than any other in the genus. The bark is used for tanning, and the wood is employed for making implements of husbandry, and for hoop-making. The Long-leaved Willow (*Salix acuminata*) differs from the other kinds in its lanceolate leaves. It is a large shrub or low tree, abundant in England in wet grounds.

The *osiers* are large bushy shrubs, sometimes becoming low trees, with long pliant branches and long, narrow, often lanceolate leaves. Any willow, however, that has long pliant twiggy branches and is grown on this account, is called an osier. *Salix viminalis* (common osier) is the species that is most used for the various kinds of basket-work, bands, &c., and for this purpose is largely cultivated in this country. It is abundant in Britain and many parts of Europe in wet meadows, and when allowed to do so, becomes a tree sometimes 20 feet in height. *Salix triandra*, an upright tree common in Britain, is extensively cultivated as an osier for wicker-work, &c. The Golden Osier (*Salix vitellina*) is a large tree, attaining a height of from 30 to 50 feet, a native of Britain, and cultivated in osier grounds. It is distinguished by its bright yellow branches. The Red Osier (*Salix rubra*), a low tree rare in England, but abundant in Scotland, is one of the most valuable osiers in cultivation.

The *willows* include a few species which are useful in the arts and medicine. *Salix Russelliana* (Russell or Bedford willow) is a large handsome tree, a native of Britain, growing in marshy woods to a height of 80 or 90 feet. The timber is useful, and the bark contains more tannin than the oak. *Salix alba* (common white willow) grows in most countries of Europe, and in North-east and Western Asia, and is more extensively planted as a timber tree than any other species. It grows rapidly, attaining a height of from 60 to 80 feet in twenty years. The bark is used in the north of Europe both for tanning and dyeing. In Sweden and Norway in times of scarcity the inner bark is kiln-dried, ground, and mixed with oatmeal to make bread. The wood is very useful, and employed for making the handles of all sorts of instruments, in turnery, mill-work, cooper, weather-boarding, &c. Willow hats and bonnets are made from the shavings of this willow. The bark may be used in medicine instead of *Salix Russelliana*, but it is not so valuable. It is frequently called the Huntingdon Willow, and under that name is recommended by Gilpin and others as an ornamental tree. *Salix Babylonica* (the weeping willow), the most favourite species of the genus, is a native of Asia, on the banks of the Euphrates near Babylon, whence its name; also of China, of Egypt, and other parts of North Africa. This tree is increasingly cultivated in this country and on the Continent for its beautifully pendulous branches. It is one of the greatest favourites in China, as might be inferred from its constant representation in Chinese pictures. Growing on the banks of its native Euphrates, it was the willow on which the weeping daughters of Zion "haired their harps." (Psalm cxxxvii.) *Salix pentandra* (sweet bay-leaved willow) is remarkable for the fragrance of its flowers and foliage, and its bark is preferred as a medicine to that of any other species, on account of its aroma. It is a small upright tree, growing

in Britain on the banks of rivers and in watery places. "It is one of the most desirable species of the genus for planting in pleasure-grounds, on account of the fine display made by the blossoms, their profusion, their abundant fragrance, the smooth, shining, rich deep green of the leaves, and the comparatively slow growth and compact habit of the tree" (London). The Crack Willow (*Salix fragilis*), a tall bushy-headed tree, common in hedges in Britain, is so called from the brittleness of the branches, which start from the trunk with the slightest blow. It furnishes good timber. *Salix herbacea* is the smallest of British shrubs, growing only from 1 to 3 inches high in the wild state. It is a native of Europe and North America, and is found in Britain only on the mountains of Wales and Scotland. *Salix arctica* and *Salix polaris*, diminutive shrubs, are found nearer the North Pole than any other woody plant. The Brown Willow (*Salix fusca*) is a common shrub in Britain on heaths and commons, trailing its wiry branches along the ground, and ascending only to the height of from 6 inches to 1 foot.

**WILMINGTON**, a city and port of entry of Delaware, United States of North America, is situated on the Christiana Creek, immediately above its junction with the Brandywine, 2 miles from the Delaware River, 28 miles southwest of Philadelphia, and 70 miles E.N.E. of Baltimore by the Philadelphia, Wilmington, and Baltimore Railway. The upper part of the city is built on the southern slope of a hill, the summit of which is 110 feet above the tide level, and commands an extensive view of the Delaware River, and the town itself. Wilmington is regularly planned, with wide and straight streets, and is generally well built of brick. It contains numerous churches, one of which was built in 1698. There are also a town-hall, a large hospital and almshouse (situated on high ground in the western part of the city), a Catholic college, a custom-house, public library, and several schools.

• Wilmington is the capital of Delaware, and by far the most prosperous and populous town in the state. It is celebrated for its manufactures, of which the principal are iron steamboats, railway cars, steam-engines, railway wheels, mill machinery, and other iron articles; powder, carriages, flour, leather, shoes, cotton and woollen goods, and farming implements. There are large flour mills on the Brandywine. The Christiana is navigable up to the town for vessels drawing 11 feet of water. Some of the inhabitants are engaged in the whale fishery. The population in 1880 was 12,199.

**WILMINGTON**, a city and port of entry of the United States, in North Carolina, is situated on the left or east bank of Cape Fear River, just below the entrance of its north east branch, 34 miles from the sea, 180 miles north-east of Charleston, and 416 from Washington. It is the largest and most commercial place in the state, and has good railway connection. There are saw mills, planing mills, rice mills, turpentine distilleries, and several machine shops. Opposite the town are fine rice-grounds. The harbour admits vessels of moderate tonnage, and the port has an extensive commerce. During the Civil War it obtained great notoriety as one of the chief ports in the Confederacy, and was frequented by blockade runners. It was captured by the Federals in January, 1865. The population in 1880 was 6367.

**WILMOT, JOHN.** See ROCHESTER, EARL OF.

**WILNA.** See VILNA.

**WILSON, ALEXANDER**, an American ornithologist, was born at Paisley, Scotland, 6th July, 1766. In 1779 he was bound apprentice to a weaver for three years, on the expiration of which time he worked four years as a journeyman, and afterwards spent nearly three years as a pedler. In 1794 he emigrated to the United States, and in July of that year landed at Newcastle in the State of Delaware, with only a few shillings in his pocket, and immediately

proceeded to Philadelphia. After trying various occupations he ultimately turned schoolmaster, and in 1802 he made a contract with the trustees of a school at Gray's Ferry, on the river Schuylkill, about 4 miles from Philadelphia, where he became acquainted with some friends who gave him instruction in drawing birds. In this art he succeeded beyond all expectation, and from that time the ruling passion of his after-life was brought into play. All the time he could spare was devoted to the examination of birds, and making drawings of them in colours. In September, 1808, the first volume of his "American Ornithology" was published in folio, with plates carefully engraved from his own drawings, coloured after nature, and with admirable letterpress descriptions. The second volume was published in 1810, and soon afterwards he set out for Pittsburg on a journey to New Orleans. From Pittsburg he descended the Ohio by himself in a skiff. He started on 24th February, and on 17th March moored his boat in Bear Grass Creek, at the rapids of the Ohio, after a voyage of 720 miles. He had made excursions from the banks of the river, as he proceeded, with his gun and drawing materials, in search of new species of birds, of which he made drawings and wrote descriptions on the spot where he shot them. The other volumes of his work were brought out in succession, with astonishing rapidity and regularity. The number of his subscribers increased, and before his death included perhaps every royal personage in Europe. In 1812 he was elected a member of the American Philosophical Society. In 1813 he published the seventh volume. He had completed the pictorial materials for the eighth and ninth when he was carried off by an attack of dysentery in his forty-eighth year. He died 23rd August, 1813, at Philadelphia. The eighth and ninth volumes were completed and published in 1814 by Mr. George Ord, who had been his companion in many of his exploring expeditions. Mr. Ord supplied the letterpress descriptions for these two volumes as well as a biography of Wilson in the ninth. Three supplemental volumes were afterwards supplied by Charles Lucien Bonaparte (folio, 1825-28).

**WILSON, JOHN** (universally known by his sobriquet of *Christopher North*), professor of moral philosophy in the University of Edinburgh, was born at Paisley, in 1785. At the early age of thirteen he was sent to the University of Glasgow, and five years afterwards was entered of Magdalen College, Oxford. After taking several college honours he graduated B.A. in 1807, and M.A. 1810. His unusual scholarship called forth remarks from the examiners, and at the same time he was the best leaper and one of the best runners and boxers in the university. It needs not to be added that he was immensely popular. He took the Newdigate prize for English poetry among many other honours. His father having purchased an estate on the margin of Lake Windermere, in Westmorland, young Wilson became a denizen of the Lake country, and there became acquainted with Wordsworth, Coleridge, Southey, and De Quincey. In 1812 he distinguished himself as a poet with "The Isle of Palms, and other Poems." In 1815 the improper dealing of a trustee cost Wilson the whole of his fortune, and it became necessary to adopt a profession. It shows the sunny nature of the man that he uttered not a word of complaint, and that he in later years absolutely supported the man whose folly (to give it no worse name) had ruined him. He qualified for the bar, and while waiting for briefs he drifted into literature: publishing in 1816 "The City of the Plague," a poem distinguished for beauty of expression and delicacy of sentiment. In 1817 *Blackwood's Magazine* was commenced, and Wilson was added to the staff. In 1825 his famous articles began, which mainly contributed to the fame of that popular publication. On the death of Dr. Thomas Brown, in 1820, he was appointed professor of moral philosophy in the University of Edinburgh; and

his success in the chair was such as to disarm his enemies and delight his friends. He afterwards devoted himself to novel writing, and produced three works of powerful interest, "Lights and Shadows of Scottish Life," "The Trials of Margaret Lindsay," and "The Foresters," which greatly enhanced his literary fame. In 1826 Wilson succeeded Lockhart in the literary direction of *Blackwood's Magazine*; and the "Noctes Ambrosianæ" were among the powerful efforts of his pen. In 1842 he published a selection of his contributions in three vols., under the title of "Recreations of Christopher North." In 1853, owing to general infirmity and increasing bodily weakness, he was obliged to resign his professorial chair in the Edinburgh University; and a pension of £300 was granted him by Earl Russell. He died at Edinburgh, in 1854. His life, by Mrs. Gordon, his daughter, is full of interesting details. A uniform edition of his works has been published by Messrs. Blackwood, of Edinburgh.

**WILSON, SIR ERASMUS**, the discoverer of the modern treatment of skin-diseases, was the son of a navy-surgeon, and was born in London, 25th November, 1809, during his father's absence with the Baltic fleet. He was a pupil of Abernethy and a fellow-student with Sir Richard Owen at Bartholomew's Hospital. At Paris, where he also studied, he was the friend of Cuvier and Geoffrey St. Hilaire. His industry was colossal, and he was a man of very varied talents. When assistant to Jones Quain, the professor of anatomy at University College, he used to illustrate the lectures extempore with sketches on the blackboard, assist Richard Quain in his researches, and help Liston in the preparation of his great work on practical surgery. In 1838 he published a "Dissector's Manual," and in 1840 the "Anatomist's Vade Mecum," which has passed through sixteen editions and is still a standard work. It was in this year that he definitely selected the skin as his special subject, skin diseases at that time being altogether ill-understood. He found the subject a quackery, and he left it a science. By 1842 he was able to produce his great work, "Diseases of the Skin," which has passed through many editions, English and foreign. In 1844 his brilliant discoveries gained him the distinction of F.R.S. In 1848 he became professor of anatomy at the Middlesex Hospital, and sub-editor of the *Lancet*. In 1847 began his celebrated folio volume, "Portraits of Diseases of the Skin," and in 1861 he conferred a lasting benefit on England by establishing the Turkish bath in this country through his book the "Eastern or Turkish Bath." Numerous treatises, essays, and books on skin diseases continued to pour forth from the indefatigable man, although his medical practice was enormous. Everything was as successful as it deserved to be, and Dr. Wilson grew very rich. The use he made of his wealth was most honourable. We give a list of a few of the more important of his princely benefactions. In 1869 he founded a chair of dermatology (skin-studies) at the Royal College of Surgeons with £5000; and was forced by a unanimous call to become the first professor of it. In 1872 he reconstituted the Epsom Medical College, and gave £7000 towards the cost. In 1873 he restored the twelfth-century church of Swanscombe, Kent, at his own cost. In 1877 he brought the famous "Cleopatra's Needle" to London at an outlay of £10,000. In the following year appeared his learned and highly popular volume "Cleopatra's Needle." In 1881 he became president of the Royal College of Surgeons, wrote his excellent "Egypt of the Past," and was knighted. In the same year he was created LL.D. of Aberdeen, and returned thanks by founding a chair of pathology in that university with £10,000. He gave £2500 to the Royal College of Music, and in 1882 spent about £30,000 in a chapel, bath, new wings, &c., at the Margate Infirmary. Sir Erasmus Wilson became blind while producing a new edition of his "Egypt of the Past," in 1882, and retired

to a picturesque bungalow at Westgate-on-Sea. He died on 8th August, 1884, having received the very rarely given gold medal of the College of Surgeons a few weeks before, the crowning honour of a career full of distinctions and titles, all fully and honourably earned.

**WILT'ON**, a market-town, and until 1885 a parliamentary borough of England, in the county of Wilts, 8½ miles from London by the London and South-western Railway, and 2 miles west by north from Salisbury, stands on the south-west bank of the Wile, just above its junction with the Nadder. The town consists chiefly of one long street. The church, formerly the abbey church, includes a nave and western tower, which are ancient, side aisles of the Elizabethan period, and a chancel of modern date. A splendid church was erected at the expense of Lord Herbert of Lea (whose remains repose in it), and completed in 1843, in the Romanesque style of architecture, with a separate bell-tower, or campanile, which is connected with the main building by a vestibule or cloister. Wilton has a station on both the Great Western and South-western lines; and the manufacture of the best kinds of carpets, for which the town was formerly celebrated, has revived. The town-hall is an ancient plain brick building. There is a hospital, founded as early as 1190. Near the town lies Wilton House, the seat of the Earl of Pembroke, a mansion of imposing appearance, standing in a noble park and gardens, and containing a fine collection of paintings and antiquities, besides a valuable library. It was here that Sir Philip Sydney composed a portion of his "Arcadia." Wilton was the capital of the ancient English kingdom of Wessex, and gave name to the county, then known as Wiltunscire. Wilton had risen into importance, fallen into decay, and again attained prosperity and prominence before the Norman conqueror landed in the adjoining county of Sussex. Eleven bishops had ruled the diocese of Wilts from the palace of Wilton before the battle of Hastings made the year 1066 the commencement of popular English history. In later times Wilton is known to the farming interest for its great annual sheep fair, and to the whole civilized world for its peculiar make of carpets; but its charters date back to times when English industry had yet made small advance in the manufacture of textile fabrics. A borough by prescription, Wilton had its charter confirmed by instruments granted by Henry I. and his successors. Curiously allied with the prosperity of the town is the history of the great family whose associations have been so long connected with it. There is a local belief that it was one of the Earls of Pembroke who introduced from France the manufacture of carpets. The monastery was given by Henry VIII. to Sir William Herbert, first earl of Pembroke. The population of Wilton in 1881 was 1826.

**WILTSHIRE**, formerly called *Wiltunshire*, from its ancient capital WILT'ON, an inland county of England, is bounded N.W. and N. by Gloucestershire, N.E. by Berkshire, E. and S.E. by Hampshire, S. and S.W. by Dorsetshire, and W. and N. by Somersetshire. It is compact in form, approximating to a quadrangle, but several small detached portions are surrounded by the adjacent counties of Gloucester and Berks. The greatest length north to south is 54 miles; the greatest breadth east to west is 37 miles. The area is 1367 square miles, or 866,677 statute acres. The population in 1881 was 258,965.

**Surface and Geology.**—The geological formations of Wiltshire consist chiefly of the Cretaceous and Cretaceous series, with their intermediate beds. The chalk, which from its extent may be considered the most striking geological feature of the county, forms the extensive downs which overspread its eastern, central, and southern districts. The great central chalk region is divided into two parts by the Vale of Pewsey, where the greensand occupies the bottom, and is skirted on each side by the chalk hills. As this valley extends east and west, it divides the chalk region

into two portions, of which the Marlborough Downs belong to the northern, and Salisbury Plain to the southern. The southern part of the county is also occupied by the chalk extending east into Hampshire and south into Dorsetshire, and forming an extensive elevated tract furrowed by the deep pastoral valleys of the Nadder, the Wiley, the Avon, and the Bourn, which unite near Salisbury in the basin of the Lower Avon. South and east of Salisbury upon the chalk lies superimposed the plastic clay formation belonging to the chalk basin of the Isle of Wight. That portion of the southern chalk district known as Salisbury Plain forms a lofty undulating table-ground, a considerable area of which is still wild, uncultivated, and uncultivated, except in the combs and hollows, where tillage has been more or less successfully undertaken. Wide downs, covered with a scanty herbage, spread in every direction. The population is collected in the valleys, where along the streams which water them, the villages are situated at short intervals. The resources of the county are almost wholly agricultural, but the unpromising soil of the high grounds prevents any great extension of cultivation.

The greensand formation, comprehending the chalk marl with the greensand, crops out from beneath the escarpment of the two chalk districts occupying the Vale of Pewsey, as well as the indentations in the boundary of the southern chalk district.

The outer edge of the greensand formation is frequently broken up by the Weald or Tetsworth clay, which usually divides the greensand from the iron-sand. The latter in this county appears only in a few places; and in its absence, the Weald clay rests along the northern and north-western borders on the Kimmeridge clay, which belongs to the uppermost division of the Oolitic group.

The formations already noticed occupy the whole of the county south east of a line drawn from the Berkshire border near Swindon, to the Somersetshire border near Westbury, the whole line describing a convex circuit from north-east to south-west. Beyond this boundary the strata of the middle oolites and the lower oolites, comprehending the coral-rag, calcareous grit, Oxford clay, cornbrash, forest marble, and a deep bed of clay, occupy all the north and north-west districts.

The most elevated parts of the county are Inkpen Beacon, on the Hants border, 1011 feet; Clay Hill, near Warminster, 900 feet; and Westbury Down, 775 feet.

*Rivers and Canals.*—Wiltshire is comprehended in the three basins of the Thames, the Severn, and the Avon. The upper part of the course of the THAMES is in this county, and here the Kennet and some smaller tributaries have their sources.

The Wiltshire, sometimes called the Upper Avon, rises in the southern slope of the northern chalk district, in the neighbourhood of Devizes, and flows E.S.E. along the Vale of Pewsey to Rushall, in whose vicinity it is joined by another stream, and thence flows south to Salisbury, where it is joined on the right by the Wiley (united with the Nadder). It is augmented a little lower down, on the left bank, by the Bourn, and still lower by another stream on the right. It then continues south to Downton, and a mile below that town enters Dorsetshire. Its length from the neighbourhood of Devizes to the border of the county is 41 miles, and its further course into the English Channel at Christchurch, about 25 miles, making 66 miles in all.

The Wiley rises in the downs north of Mere, in the south-west part of the county, flows north-east and then south-east, and having received the Nadder near Wilton on its right bank, proceeds east to its junction with the Avon at Salisbury. Its whole length is about 27 miles.

The Bourn has its source just within the northern boundary of the southern chalk district, and flows south to the east side of Salisbury, where it joins the Avon; its whole length is about 23 miles.

A limited area about Mere, in the south-western corner, is drained by the upper waters of the Dorsetshire Stour, which rises at Stourhead. The Stour and the Wiltshire Avon unite just above the outfall of the latter into the English Channel.

Those districts of the county which belong to the basin of the Severn are drained by the Bristol Avon, whose source is in the Cotswold Hills, at Horton, in Gloucestershire. It flows south-east, south, and east, through the north-west part of Wiltshire, to Bradford, near which it enters Somersetshire.

The navigation of the Thames, the Kennet, and the Bristol Avon does not commence until after those rivers have quitted the county; but the want of river navigation is partially supplied by three canals, as well as by the extensive railway system of the Great Western and South-western lines.

*Agriculture and Manufactures.*—In an agricultural point of view the county may be divided into two districts: the southern comprehending all the Wiltshire Downs, with their intersecting valleys, and being separated from the northern by an irregular line running round the base of the chalk hills, from their entrance near Swindon on the north-east, to their termination near Westbury on the south-west.

The downs are for the most part destitute of trees. The soil on them varies little, being thin, scanty, and uniformly resting on the chalk. It produces an excellent short herbage, very well suited for sheep pasture. The proportion which has been converted into arable land is comparatively small, and lies chiefly on the borders of the valleys. As we descend into the latter, the earth generally becomes less mixed with flints, and of a more loamy nature, in consequence of the waters washing down portions of the upper soil, whose finer particles are deposited on the sides of the hills, and form what is called "white land." The level part of the valleys nearest the rivulets consists of flints washed down lower, and mixed with fine earths.

As the cows in this district are not such objects of attention as the sheep, the breeds are very various, and few of them of superior quality. The Wiltshire sheep are a variety of the South Down, but not generally so pure.

The north-western district differs greatly from the southern, consisting chiefly of plains which slope north to the basin of the Thames. Where the top soil is thin, it is chiefly cultivated as arable land; where it is deep and rich, it produces some of the finest pastures in England, such as those about Chippenham, and thence southward to Melksham and Trowbridge, where the largest oxen may be fattened. This district is essentially a dairy one. The grass land forms the greater portion of the north-western district, and the cheese made there is justly celebrated. The swine which are reared here enjoy a deserved celebrity, and for Wiltshire bacon the demand is large and permanent.

Carpets are made at Wilton; cutlery and steel goods at Salisbury; ropes and sacking at Marlborough; silk goods at Devizes; and woollens at Bradford and Trowbridge. There are iron mines and blast furnaces at Westbury and Seend, and a large iron-foundry at Chippenham.

*Divisions.*—Wiltshire is divided into twenty-nine hundreds and 347 parishes. It lies partly in the diocese of Salisbury, and partly in that of Gloucester and Bristol. It is included in the Western circuit. The spring assizes are held at Salisbury, and the summer at Devizes. For parliamentary purposes it is divided into five divisions, each returning one member. The borough of Salisbury also returns a member.

*History and Antiquities.*—A large portion of Wiltshire was occupied by the nation or nations who are mentioned by Ptolemy under the generic name of Belgæ (*Belgæ*). The county abounds with memorials of Romans, Britons, Saxons, and Danes, and contains some of the most inter-



esting monuments in the country, such as AVENURY and STONEHENGE.

**WIMBORNE MINSTER**, a very ancient market-town of England, in the county of Dorset, 7 miles from Poole, and 108½ from London by the South-western Railway, is situated on the Stour, near its confluence with the Allan. Its name is derived from a name given to the Allan—the Win or Vin—and the present minster was erected soon after the Norman Conquest on the site of a nunnery established in the eighth century. The minster consists of a nave, choir, transept, three porches, a central tower, and a tower at the west end. It ranks second for beauty among the ecclesiastical buildings of Dorset, and is a royal free chapel. It was here that St. Ethelred, the king of Wessex, brother and predecessor of Alfred the Great, was buried in 871. The town has some coach-building works and manufactures of buttons and woollen hose, but there is little trade. There is an endowed grammar-school. The population in 1881 was 5390.

**WINCHESTER**, a market-town of England, with a railway station, in the county of Gloucester, 14 miles N.E. from Gloucester, is beautifully situated at the base of several hills, having the little river Isbourne, an affluent of the Upper Avon, flowing through it. This place is of great antiquity, and was once of importance, having been anciently the site of a castle and of a mitred abbey, sufficiently large for the accommodation of 300 Benedictine monks. Every trace of these buildings has been long ago destroyed. The town consists chiefly of two streets intersecting each other; the houses are mostly low and are built of stone. The church is a fine Gothic building, with an embattled tower at the west end. There are a town-hall, mechanics' institute, and manufactories for silk and paper, and a tanyard and flour mill. The population in 1881 was 2834.

**WINCHESTER**, a city of England, the county town of Hampshire, a municipal and parliamentary borough, 62 miles from London by road, and 65 by rail, stands on the river Itchen, in the midst of undulating chalk downs, and consists of several clean and regular streets, intersecting the High Street, in which stands a fine Gothic cross, 43 feet high. Originally it was a town of the Belgæ, called *Gwent* (or White), from which the Romans styled it *Venta Belgarum*, and the Saxons *Wintanceaster*. It was the favourite seat of many of the Saxon and Norman sovereigns, and is mentioned in the Domesday Survey. At one period it had as many as ninety churches, some of which were swept away at the Reformation, and others razed in the Civil War, as well as the city walls (except the west gate), and Wolvesley Castle, an old seat of the bishops, of which only the keep remains.

The chief glory of the city is the cathedral, a cruciform structure of various ages, begun in 1079 and finished in the sixteenth century. The character of the building was originally pure Norman, and the transept and central tower, built by Bishop Walkelyn, are admirable specimens of that style. The interior is very splendid, equalling in many respects the magnificence of York Minster. A fine oak screen was added in 1875.

It contains the tomb of William Rufus, and in a series of carved chests over the choir are the remains of many of the kings of Wessex, and of the Saxon kings of England. The altar-piece is the celebrated "Raising of Lazarus," by West.

Winchester diocese was founded in 660. It embraces the archdeaconries of Winchester and Surrey. The bishop's seat is Farnham Castle.

Next in importance to the cathedral is St. Mary's or Winchester College, which was founded by William of Wykeham in 1387. The buildings, consisting of two substantial quadrangles and a cloister, were completed in 1393. In 1870 a library was erected as a memorial of

Dr. Moberly, bishop of Salisbury, who for thirty years was head master of the college. Besides the foundation scholars, who are elected between the ages of ten and fourteen, and are boarded and educated at the expense of the college, there are about 200 commoners, who board in the houses of the masters. In connection with the college there are fellowships and scholarships at the New College, Oxford. A Diocesan Training College was erected in 1863.

In the Cathedral Close are the bishop's old chapel and palace, by Wren; the Deanery or Hall of St. Swithin's ancient priory; Refectory and Keep of Wolvesley Castle, &c. The city also contains about a dozen churches, most of which are ancient; and several denominational places of worship. The county hall is 110 feet long, and was formerly a chapel to William the Conqueror's castle, containing Arthur's Round Table. The other buildings include the Guildhall (comprising assembly room, museum, &c.), opened in 1873; law courts, completed in 1875; Cheyney or Bishop's Prison; market-house, and Pent House Piazza; Corn Exchange, 110 feet long; Gothic masonic hall, erected in 1868; several banks; market hall; subscription library; museum in which the standard Winchester bushel and yard are kept; theatre; king's house barracks, built by Wren as a palace for Charles II. out of the materials of the Conqueror's castle; school of art; hospital of St. Cross, founded 1132, by Bishop de Blois, containing a good Norman church (restored in 1865), refectory, infirmary, and Hundred Men's Hall, where thirteen poor men are maintained, and bread and beer are given to any passer-by who asks for them; Bishop Morley's College for clergy widows; diocesan training college; Symmond's, Christ's Hospital; St. John the Baptist's Hospital, comprising Over's School, Lamb's Almshouses, a common hall, &c., and county hospital. A stone bridge crosses the Itchen. The cemetery is 7 acres in extent, and well laid out. The celebrated City Cross was restored and improved in 1865 under the direction of Sir G. G. Scott. The trade of Winchester is a general one; formerly it possessed a share of the woollen manufacture, but that is now quite extinct.

The city received its first charter from Henry II., and returned two members to the House of Commons from the 23 Edward I. until 1885, when it was deprived of one member. The number of electors in 1888 was 1980. The municipal borough (the limits of which are co-extensive with those of the parliamentary one) is governed by six aldermen (one of whom is mayor) and eighteen councillors. The population in 1881 was 17,780.

**WINCHESTER, STATUTE OF** (1285). This important mediæval police statute (13 Edward I.) is interesting as showing the state of the country at the time. It forbade the compounding or concealment of felonies, and regulated the hue and cry; districts where a felony had been committed had to discover the culprit within forty days or submit to heavy fines. The watch in towns was defined, all strangers were to be questioned and detained if suspicious. Every man was ordered to keep in his house and in readiness the legal military equipment due to his station (decreed by the Assize of Arms, 1181), thus providing a militia always ready to be called out when necessary. The officers of the district were commanded to clear away all trees and bushes for 200 feet on each side of the high road, that no robbers might lie concealed: but it was felony otherwise to cut down any large trees, and especially oaks, all of which the government required for the reorganization and maintenance of the navy, a great feature of Edward's reign.

**WINCKELMANN, JOHANN JOACHIM**, the celebrated archæologist, was born in the humblest walks of life at Stendal, in Prussia, in 1717. Though very poor, he was a diligent student, and was able to qualify himself to offer his services, in 1748, to Count Bünau, at Dresden,



as secretary and librarian. At Dresden he was first initiated into the history and principles of ancient art, and his enthusiasm grew to such a height, that he did not consider his conversion to Romanism (1754) too high a price for a librarianship at Rome, which Cardinal Archinto had promised him on that condition. In 1763 he was appointed by the Pope superintendent of the antiquities in and about Rome. In 1768 he visited Vienna, where he was most graciously received and loaded with presents by the Empress Maria Theresa. These very presents, however, proved fatal to him, inasmuch as they excited the cupidity of an Italian robber of the name of Arcangeli, whose acquaintance he made at Trieste, and who stabbed him in his hotel on the 8th of June, 1768. Winckelmann's last words were a request to pardon his murderer, who was nevertheless executed a fortnight after. The immortal fame of Winckelmann rests on his "History of Ancient Art" (*Geschichte der Kunst des Alterthums*, Dresden, 1764), which has been translated into almost all European languages. He raised to the dignity of an independent branch of learning what had hitherto found its place only in the scattered notes of learned editors. To the "History of Art," the "Monumenti Antichi Inediti" (Rome, 1767-68), two volumes, serve as an indispensable companion. Among the minor works, the "Notes on the Architecture of the Ancients," the "Reports on the Discoveries at Herculaneum," and the "Thoughts on the Imitation of the Greek Works of Painting and Sculpture," take the first rank. The best edition of Winckelmann's complete works is that by Fernow, Meyer, and Schulze; new edition, Leipzig, 1828. See also Goethe's "Winckelmann und sein Jahrhundert."

**WIND** is air in movement, and the cause of the movement is the pressure of any mass of air which is heavier upon any other which is lighter; that is to say, wind results from the inequalities of weight in the atmosphere. These inequalities arise from heat, chiefly the direct heat of the sun, warming and making relatively lighter certain portions of the air, so that the heavy less-warmed air seeking (like all fluids) the lowest level, presses upon the warmed air and pushes it upwards, exactly on the principles governing the rise of a balloon. The air does not move directly towards an area of low pressure, however, but reaches it by a curved direction, moving circularly in the opposite direction to the hands of a watch. The cold dense air flows along descending slopes just as water streams along river-beds; and we observe the current and its direction, either by observing the effect upon movable objects or feeling it upon our skins.

But, like all analogies, that of the river of air must not be pushed too far; for wind moves neither in a smooth sheet, like a glacier, nor in a concentrated vein, like a river, nor in curving surfaces, like sea-waves. This we can at once admit, because if the air flowed in vast sheets, the pressure of the wind all over the area would be equal, whereas observation shows it to be full of abrupt changes and intermissions. We see the true nature of wind-movement by observing its effect upon a field of corn, and in this and similar cases it at once becomes evident that the air moves in gusts, a vast projectile of air being shot forward through the air ocean so to speak. Between the wind-blasts there is air which does not move, and (besides this irregularity) there is a very great difference between wind-blasts and the regular waves of water, between which there are waterless hollows. Again, observing our field of corn, we see that the aerial projectiles are limited in area, some parts of the field bending violently, while the adjacent parts are scarcely moved. The friction of air is so slight that a wind-blast scarcely affects the air at its sides; and after one of the terrific hurricanes of the West Indies the path of a wind-blast can be traced by a narrow lane of uprooted trees in the forest, while on each side the trees stand without a leaf being injured. Without going beyond

these simple facts, known to all, wind is seen to be a succession of gusts of air, more or less violent, and more or less sharply separated.

Winds are divided into *permanent winds*, *periodical winds*, and the *variable winds* of high latitudes.

*Permanent winds* are the trades and anti-trades, prevailing over great parts of the year, over large surfaces of the earth. In the article *TRADE WINDS* a full consideration of the causes of the trades is entered into.

*Periodical winds* are best exemplified by the *Monsoon*, which also is dealt with in a separate article.

*Variable winds* are those which we enjoy, and which are variable enough certainly. They are exceeded, however, in irregularity by the baffling and uncertain currents, interspersed with wearisome calms, which occur in the region between the two trade winds, in equatorial latitudes, and cause serious delay to the seamen who are unfortunate enough to be driven among them. Speaking generally, the broadest generalization we can make of our own winds is that in winter the air flows off the land on to the sea, and in summer it flows off the sea on to the land, in the same way and from the same cause as the land-breeze and sea-breeze of afternoon and early morning by the sea-side. Beyond this there is a great local prevalence of south-west and north-east winds in Central and Western Europe. This prevalence of the warm, winter, south-west wind (good for at least  $5\frac{1}{2}$  degrees rise of temperature) keeps Western Europe warm, while the cold, winter, north-west wind constantly beating on the east coast of America, and lowering the temperature  $4\frac{1}{2}$  degrees, chills the land until we find that Labrador, in the same latitude with ourselves, has an average temperature 40 degrees lower than our own. The cause of this double phenomenon is that in winter the areas of high pressure are of course over the land, because it is colder than the sea. Now, since winds always circulate round areas of high pressure in the northern hemisphere in the direction of the motion of the hands of a watch (and in the southern hemisphere in precisely the opposite direction), it is at once evident that all the western coasts of the great oceans will have prevalent southerly winds, all the Eastern coasts prevalent northerly winds in winter. In spring this is of course reversed, the land begins to be an area of low pressure, and the circulation of the air to take the reverse direction to the hands of a watch: we at once think of our biting easterly winds of March and acknowledge their cause.

The familiar land-breeze and sea-breeze of the seaside have been referred to, and it is perhaps necessary to correct the prevalent idea that a sea-breeze is due to the air rising from the heated land and the cooler air flowing in from off the sea to replace it. This would mean that the breeze would begin off the shore and extend bit by bit out to sea; but the opposite is the case, as everyone knows, the landward breeze of a calm afternoon beginning a mile or two out at sea, and can be watched curling the water long before it is at all perceptible on the shore. The true course of events is thus:—The air above the heated land rises almost in a mass, like a dome, pushing away the colder air above, which slides off down the side of the rising dome seaward, and thus exerts pressure upon the air a little way out at sea; the consequence is of course that the air thus pressed upon flows towards the area of less pressure, and after a short time the breeze which set in from the offing reaches the shore a little after noon, and gently fans the heated land till sunset. Shortly before midnight the cooling land sinks enough below the level of the sea-temperature to reverse the conditions, and the land-breeze begins a little way inland, reaching the coast in the small hours of the morning and blowing seawards till sunrise brings its calm with it. The same effect occurs in all large lake districts. The land-breeze is dry, the sea-breeze moist; and in tropical countries where the differences of

moisture are excessive, because very warm winds can contain so much more moisture than with us, these changes are most trying, and the land-breeze becomes positively dangerous. In Southern India and Ceylon horses are seriously injured, and may even die, if exposed during the hours after midnight.

**Names of Winds.**—Our system of naming winds by the points of the compass whence they blow is of course the best, as it is the most precise, but it is certainly not so picturesque as the nomenclature by special names once universal, and still more usual in the greater part of the world. As these names are often referred to, a short list of some of the more common of them may prove convenient. For instance, the magnificent *onomatopœia* (sound setting forth sense) of Milton loses half its beauty to him who does not know the classical *venti*:—

"Boreas and Cæcias and Argestes loud,  
And Thrascias rend the woods and seas upturn,  
Notus and Afer, black with thunderous clouds  
From Serrallona. Thwart of these, as fierce,  
Forth rush . . . Eurus and Zephyr . . .  
Sirocco and Libecchio."  
—"Paradise Lost," x. 609.

**Classical Winds.**—These are Boreas, N.; Cæcias, N.W.; Argestes, N.E.; Thrascias, N.N.E.; Notus, S. (also called Auster, whence our Australia, &c.); Afer (i.e. the African), S.W.; Eurus, E.; Zephyrus, W.; Syrius (or in Italian, Sirocco, i.e. the Syrian wind), S.E.; Libycus (or Libecchio in Italian, the Libyan wind), S.S.W.

**Etesian winds** are the yearly or periodical northerly winds (Gr. *etos*, a year) which blow in the Ægean about forty days from the rising of the Dog-star.

**Samûl or Simoom** (Arab. *samoom*, destruction) is a hot suffocating whirlwind that blows in whirling clouds of sand across Africa and Arabia. On the African coast, in Malta and Sicily, and in Italy the kindred *Sirocco* (S.E.), which descends from the high land of Africa, and is therefore dry as well as hot, enervates its victims, striking them with unconquerable languor. A spell of the Sirocco is often succeeded by a spell of the Tramontana.

**Tramontana**, a cold dry northerly wind descending from the Alps and Northern Apennines in Italy. One branch, the *Bora*, is a furious northerly wind at Trieste and in Dalmatia; another, the *Mistral* (N.W.), is the plague of Marseilles, Provence, and the Riviera.

**Harmattan** is the name of the hot east wind on the west coast of Africa, coming off the desert and bringing with it clouds of reddish dust to cover sails and decks of ships far out in the Atlantic. In the winter it is felt as far south as Sierra Leone.

**Solano**, the Spanish south-east wind, comes from Africa hot, dry, and heavily charged with dust, as the Harmattan. "A-k no favour during the Solano" is a shrewd Spanish proverb.

**Khamsein** (Egyptian, "fifty"), the hot wind from the desert in Egypt, which blows for fifty days before the rising of the Nile, is another of these hot, dry, dusty winds.

**Buran** is the name of the furious north-easter of Central Asia, very cold and filled with drifting snow. The worst of such winds is the *Purga* of the Lower Yenisei, when the whole air is filled with snow, and the traveller is unable to move till the maddened gale has exhausted its rage.

The **Nortes** (Northerly) of the Gulf of Mexico are dangerous and very prevalent winds, skirting the trades, and balanced by the *Pamperos* of the Brazilian coasts, which, of course, are southerly. These last get their name from their course over the Pampas.

The **Bunós** are the driest winds in the world, and blow across the table-lands of Peru for four months of the year. The south-east trades, blowing across Brazil, leave their moisture on the eastern slopes of the Andes, and the north-west trades do the same upon the western slopes; both reach

the table-lands of Lake Titicaca so cold and dry that the dead need not be buried and the living have to shield themselves with masks. In one of our museums is a Peruvian body, exhumed from 10 feet deep, which is perfectly desiccated and has become a sort of mummy.

**Fohn** is the name of a well-known pest of Switzerland, a hot, dry, southerly wind coming from the Italian coast warm and moist, leaving its moisture on the southern slopes of the Alps, and then becoming warmer as it descends into the valleys on the north. But a cold wind holds little moisture, and such a cold dry wind when warmed is felt as exceedingly parching from its avidity for moisture and its keen desiccating property.

**WIND INSTRUMENTS** are divided into *wood wind* and *brass wind*. [See INSTRUMENTATION.] The first strictly brass band was formed in 1710, and this combination had great vogue for a long time. It has particular merits of its own, but it is generally found advisable now to add clarionets (and flutes, oboes, and bassoons also in the better bands) to aid in satisfactorily rendering rapid passages.

**WINDERMERE**, the largest lake of England, lies chiefly in the county of Lancaster, in that part called Lancaster-in-Furness, and partly divides Lancashire from Westmorland. It is 11 miles long, north to south, and has an average breadth of one mile; height above the sea, 116 feet; depth, 210 feet. It discharges south into Morecambe Bay by the river Leven. The hills on its borders are not elevated, but have picturesque outlines and groupings, and are richly wooded. There are several small islands, also finely wooded. The village of Windermere is situated on the east side of the lake, in the county of Westmorland, 7 miles W.N.W. of Kendal.

**WINDSOR**, formerly called *New Windsor*, a municipal and parliamentary borough, in Berkshire, is 21 miles W. by S. from London by the Great Western, and 26 by the South-western Railway. It derives its importance, and perhaps its origin, from having been a favourite residence of many of the kings and queens of England since the Conquest. The Saxon kings had a palace at Old Windsor, called by them *Windleora* or *Windshore*, and Edward the Confessor occasionally kept his court there; but it is now a distinct parish, about 1½ mile south-east from New Windsor.

Windsor is, in general, well built, is situated on rising ground on the south-east or right bank of the Thames, and consists of six principal streets, well-paved, besides a number of smaller ones. The main thoroughfare winds close around the west and south sides of the castle. Eton, on the opposite bank of the Thames, forms in appearance one town with Windsor, the line of houses being interrupted only by the bridge, a neat structure of iron on granite piers, 200 feet long and 26 feet wide, and consisting of three arches. The public buildings of Windsor (exclusive of those pertaining to the castle) are not very remarkable. The Lower Castle Ward is divided into two parts by St. George's Chapel, which stands in the centre. This chapel was begun by Edward IV. (1461-83), and was not completed until after the commencement of the sixteenth century. It is one of the most beautiful specimens of ornamental Pointed architecture in this country, and contains the cenotaph of the Princess Charlotte. Edward IV., Henry VI., Henry VIII., and Charles I. were buried here. At the foot of the altar is a subterranean passage communicating with Wolsey's tomb-house (restored in 1861), in which George III., George IV., William IV., and others of the present royal family were interred. The Wolsey Chapel is now known as the "Albert Memorial Chapel," a series of magnificent renovations having been effected in it for this purpose. The process was completed in 1876, the works, carried on at an unlimited outlay, having extended over ten years. Windsor chapter includes a dean,

four canons, and four minor canons, in whom is vested the patronage of fifty-six livings. The parish church was completed in 1822, in the later Pointed style, and carefully reconstructed in 1870. The other buildings in the town comprise places of worship for dissenters, including a handsome Roman Catholic chapel, opened in 1868; a town-hall, erected in 1866; the Albert Institute, opened in 1380; royal, free, and industrial schools, built in 1862; several other schools and charitable institutions, a theatre, and military barracks, which last were rebuilt in the year 1869. The most important of the charities is an hospital for invalid soldiers, established by George III.; others are a lying-in institution; parish hospital for twelve poor people; royal general dispensary, and some almshouses. There is also a public ground, with an obelisk commemorative of the jubilee of 1810. The town has well-supplied markets, some trade in corn, and is famous for its ale; but the resources of the inhabitants are almost solely derived from the presence of the court and the influx of visitors, who come in great numbers to see the Park, Virginia Water, and the Castle. Not far from Frogmore is Beaumont Lodge, now a Jesuit college.

The municipal borough of Windsor is divided into two wards, and governed by five aldermen and eighteen councillors, including the mayor. The parliamentary borough returned two members to the House of Commons until 1867, when it was deprived of one. The boundaries of the municipal borough were enlarged in 1868, and the population in 1881 was 12,273; of the parliamentary, 19,082.

The castle is surrounded on two sides by the Little Park, which comprises about 13 acres. In the reign of Queen Anne that part of Windsor Forest which remained the property of the crown, under the name of the Great Park, was cut off from the castle by the intervening private property; and it was therefore determined to buy as much land as might be required to complete an avenue from the royal residence to the forest. This is the present Long Walk, which is a perfectly straight line, above 3 miles in length, running from the principal entrance to the castle to the top of a commanding eminence in the Great Park, called Snow Hill. On each side of the road, which has a gentle rise, flomishes a double row of stately elms, now in their maturity, and the avenue is therefore one of the most magnificent in the kingdom. In 1832 a colossal equestrian statue of George III. was erected at the top of the Long Walk. At the southern extremity of the Great Park lies Virginia Water, the largest artificial lake in the kingdom. It is very picturesquely situated, being hemmed in by thriving plantations.

*Windsor Castle*, after having been rebuilt by Henry I., was enlarged by Henry III.; but it was not till the fourteenth century that the plan of the whole began to assume its present extent and arrangement, when Edward III. first erected the buildings forming the Upper Ward, east of the Keep. The same king founded the College or Free Chapel of St. George's, in the Lower Ward. These works were carried on from about 1350 to 1374, and were chiefly conducted by William of Wykeham. From this period comparatively little was done until a century afterwards, when Edward IV. began to re-erect St. George's Chapel. Henry VII. made some additions to the castle, and Queen Elizabeth caused the terrace to be formed, thereby giving to the royal abode of Windsor what is not the least striking or least attractive of its characteristics. Under the Stuarts nothing material was done until the Restoration, when the edifice began to be modernized in a tasteless manner. The principal addition made by Charles II. was the Star-building, containing the state apartments. George III. restored the interior of St. George's Chapel (1787-90), which was done in a very judicious way, by scrupulously following the original details. In 1796 James Wyatt was first em-

ployed at Windsor, and Gothicized the Star-building and the corresponding portion on the north side of the inner quadrangle as far as St. George's Hall. George IV. having announced his intention of taking up his abode within the castle, and converting it into a suitable residence for himself and his successors, a grant of £300,000 was voted by Parliament, in April, 1824, for the projected improvements, and four architects were called upon to furnish designs for the intended works—Somers, Nash, Smirke, and Jeffrey Wyatt. Wyatt's plans were approved of, and no time was lost in carrying them into execution, the first stone of King George IV.'s gateway having been laid by the king himself, 12th August, 1824; on which occasion the architect received the royal authority for altering his name to that of Wyatville; and on the king's taking possession of the private apartments, which were completed by the end of 1828, he received the further distinction of knighthood. After the first grant of £300,000, others were successively made, and the total expenditure down to the end of the reign of William IV. amounted to £771,000, to which £100,000 more has since been added. As thus restored and enlarged, this magnificent structure covers 12 acres, and contains most valuable collections of paintings and articles of vertu. It consists of three wards, called the Upper, Lower, and Middle Wards, the last being the great machicolated keep, 100 feet in diameter, that crowns the whole pile, and from the top of which there is a magnificent view. The Upper Ward, or principal quadrangle, includes the royal state and private apartments, a Norman gate, and a tower called after William of Wykeham, the architect of the earlier building. It is one of the several towers of different epochs still existing, and incorporated with the modern structure. St. George's Hall or Banqueting-room, is 180 feet long. In the Audience-room are West's historical paintings; and the Vandyke-room contains a series of portraits by the great artist from whom it is named. The terrace is around the exterior of this quadrangle, and is 1870 feet long. In the Lower Ward stand the cloisters, the deanery, residences for the canons, and naval and military knights of Windsor, and St. George's Collegiate Chapel, before described.

The Home Park, of 500 acres—an ancient and beautiful domain, surrounding the castle on two sides—contains the Royal Gardens, and Frogmore, formerly the residence of the Duchess of Kent. Here, also, stands the magnificent mausoleum erected by her Majesty for the reception of the remains of the Prince Consort. The Great Park comprises about 10,000 acres, well stocked with deer; and Windsor Forest, to the west of it, is 56 miles in circumference. The former contains the Model farm; the Cumberland pillar; the King's (*i.e.*, William the Conqueror's) oak, 26 feet round; Queen Victoria's oak, and other famous trees. In 1887 the Queen laid the foundation stone of a replica of the Prince Consort's statue at Glasgow, erected with a portion of the Jubilee Tribute raised by the women of the empire. It stands on "Smith's Lawn" in the Great Park. Herne's oak, in Windsor Forest, so celebrated in connection with Shakespeare's "Merry Wives of Windsor," was blown down in 1863; and a memorial stone and young tree mark the spot. In 1873-74 very extensive works were carried out for the improved drainage and water-supply of the royal domain, and in 1876 an embankment was constructed for some distance to prevent the floods to which the town had previously been liable.

**WINDWARD ISLES**, a federal colony of Great Britain, comprising the islands of Barbadoes, St. Vincent, Grenada, Tobago, and St. Lucia.

**WINE** (Fr. *vin*; Ger. *wein*; Old English, *win*; Dutch, *wijn*; Span. and Ital. *vin*; Lat. *vinum*; Gr. *oinos*) signifies the fermented juice of the grape only, when an uncompound word; but it is also applied as a general term

to the fermented product of other fruits. The juice of the grape (*must*) ferments spontaneously at 70 degrees; the probability therefore is that wine was very early known, particularly in hot climates, where drink is so much required to allay thirst.

Wine is the oldest known fermented liquor, its invention being ascribed to Noah in the traditions of the Jews, almost immediately after the deluge. The writings of Moses show that the kings of Egypt drank wine, as all who have perused them will not fail to recollect in reading the story of Joseph and the chief butler of Pharaoh. The ruined temples of Thebes also display the emblems of the vintage in bas-relief, and figures of men pressing grapes with their hands, the *must* flowing into goblets emblematic of the wine-press. The early Greek poets also sang the praises of wine. Homer speaks of wine in its eleventh year; Athenæus and Horace commend wines of greater age, while Pliny relates that he had drunk of that which was 200 years old, and which was thick and harsh.

The principal component of the juice of ripe grapes is water, in which are various substances, either held in solution or very minutely divided. The juice as obtained by pressure is more or less thick, and rapidly changes into a fermented liquid. FERMENTATION being excited, alcohol and carbonic acid gas are formed by the decomposition of the sugar contained in the fluid.



The process once commenced continues, independently of any further influence. Although the reaction shown above represents the principal product in the wine, there are a number of secondary reactions occurring simultaneously, but to a small extent.

Many of these are somewhat obscure, but the most important in results is the formation of compound ethers which give rise to the peculiar flavour and odour so characteristic of many wines, and form what is called the "bouquet" of the wine. Wine of the grape is divided into *dry* and *sweet*, and every variety is included under one or other of these divisions. In some a part of the sugar remains undecomposed, and this condition constitutes the *cins de liqueurs*, the fruity or sweet wines.

The vine grows on every sort of soil, but that which is light and gravelly seems best suited for the production of fine wines. It succeeds extremely well in volcanic countries. The best wines of Italy are produced in the neighbourhood of Vesuvius; the famous Tokay wine is also made in a volcanic district, as are several of the best French wines, many parts of the south of France bearing evident marks of extinct volcanoes. In Medoc the vine grows on sand mixed with pebbles; in Anjou, on clay; in Champagne, on chalk. The wine known as Hermitage is produced from vines growing on granite rocks, and the best vineyards of Burgundy are on limestone cliffs and marshy ground.

Of the British colonies Australia alone seems likely to become a great wine-producing country. Among the wines of all countries shown at the Colonial Exhibition held in London in 1886, those of Australia took a very high place. But in the colonies generally, and in the United States of America, not long ago covered with primeval forests, the soil, enriched by the autumnal spoils of ages, is in most places too rich for the vine, the fruit of which, for making good wine, differs so much from the character of fruit in general when intended for the table. By a remarkable peculiarity and habit of the vine, it adapts itself to those parts of a country which are least fitted for the cultivation of cereals. Those vines which bear the best fruit for the choicest dry wines, invariably grow on soils which would be unproductive with respect to food crops.

Dry and sweet or *liqueur* wines, then, are distinguished

principally by the exhaustion of the saccharine in the dry; and in the sweet, by its not being all converted into alcohol; the glucose surpassing the gluten in proportion, the change is in consequence only partially effected. Another wine of a very distinct character is procured by suppressing the fermentation; in other words, by retaining the carbonic acid gas to a considerable extent. This species comprehends the wines of Champagne, Burgundies, Moselles, Hocks, and other light bodied wines, all managed in the same mode. Champagne wines are distinguished as still, creamy, and sparkling, or *mousseux*, *crépans*, and *non-mousseux*, of which the last are most in esteem. These wines are produced principally on the banks of the Marne, and constitute a unique class. The choicest are made from the best varieties of white or black grapes, gathered with care, and the sound fruit only is used. The grapes are carried to the press in baskets, covered up from the sun, and placed on the press with as little motion as possible. The *must* is poured into vats for a term of from six to fifteen hours, that the dregs may be deposited. As soon as the fermentation commences the wine is transferred to hogsheads of about 44 gallons each. At Rheims, the great emporium of this manufacture, tuns holding 12,000 litres were introduced some years ago, and the advantage of their use became unquestionable.

The operation of bottling takes place in April and continues till June. The liquid in the hogsheads is of a uniform amber colour. The bottles, which are those from which the wine is to be drunk when finally prepared for drinking, are filled to within an inch of the lip and corked, the corks being fastened down with a narrow piece of iron called an *agrafe*, bent into a hook at each end. This catches under the rim which surrounds the mouth of the bottle, and can be rapidly applied or removed, and re-used indefinitely; the bottles are never changed, but the corks are on each operation. The bottles thus filled and corked are laid in horizontal lines supported by laths, extending many hundred feet in length, from 10 to 12 feet wide. If the wine has been properly made fermentation goes on vigorously for about three weeks, a period of anxiety to the manufacturer, on account of the breakage, which is sometimes enormous; the average, however, is 10 per cent. The wine is carefully unised and shifted for two, three, or four years, until ready for the final transformation; ordinary wine is seldom kept beyond two years, the choicer sorts for a much longer time.

The next stage in the preparation is to remove the sediment. The bottles being placed carefully on their sides and left in perfect repose, the sediment in a short time is deposited on the lower side of the bottle, the wine appearing above the deposit pure and limpid. The bottles are then placed in a diagonal position upon racks, the happy invention of Mmc. Clicquot. Holes are pierced in the sides of these, and the necks of the bottles being thrust through are maintained at an angle of about 45 degrees, the raised bottoms projecting outwards. After being so arranged within convenient reach of the workman, he daily, for six weeks or so, takes hold of each by the bottom, giving it a half rotary motion, and slightly changes its position. The sediment is thus finally shaken down into the neck of the bottle and rests on the cork, the bottle being ready for the next process, the disgorging of the sediment. The *degorgeur* places himself close by the bottles with his apparatus, consisting simply of a basin opening into a reservoir below, and supported by a wooden frame covered by a hood. The workman, standing before the basin and holding the bottles diagonally with the neck downwards, disengages the *agrafe*. The cork, impelled by the gas, is driven out, followed by the sediment clinging to it, and also by the frothy wine. The flow of the latter, however, is at once checked by the finger of the operator, who gives the bottle some quick half-turns, so that the

wine allowed to escape may effectually rinse out the neck; a few instants complete the operation, with the loss of not more than a couple of spoonfuls of wine. The hood intercepts the flying cork, wine, and sediment, which latter are allowed to escape; the cork and *agrafe* are retained for future use. To prevent the further escape of gas and wine the *degorgeur* immediately stops the orifice with one of the corks, which, having been already used and compressed, is easily done, and secures it with the *agrafe*. The wine is then dosed, corked, and fastened down with string and wire. The workmen are seated in a row together, with their necessary tools, &c., within reach. The bottle first passes through the hands of the doser, who uncorks it, and allows what he thinks sufficient of the wine to escape, replacing it to within the proper distance from the mouth with a fluid from a tin measure, and which, flowing smooth and amber-coloured from its nozzle, looks like the purest spermaceti oil. This liquid is the *liqueur*, an indispensable constituent of all wine known as champagne. It consists of a saturated solution of sugar-candy in white wine of the best *cuvée*, with a small portion, about 8 per cent., of the finest Cognac. The quantity of this syrup used depends upon the original character of the wine and the degree of sweetness intended to be given. The Russians demand a wine sweet and strong; the English a very dry but vigorous champagne; while the French and other continental consumers prefer a light sweet wine. Dry champagne, to be good, must be made of the finest raw wine, every natural feature of which is discernible; but sweet champagne can be made of almost any materials, as the sugar masks its original character.

The finest red wines in the world are those of Burgundy, in the district of Côte d'Or, and are produced chiefly from the grape called Pinon. The finer wines are all produced in the districts of Nuits and Vosne; of these the Romanée-conti and the Chambertin are among the more celebrated. The white wines of the same district are not so well esteemed as the red. The exception is the Mont Rachel wine, a celebrated growth, made near Beaune, which presents one of those extraordinary phenomena in wine which no scientific investigation has succeeded in explaining. Three kinds of wine are made of fruit grown on the same land, so contiguous as only to be separated by a footpath, having the same exposure, the soil and species of vine apparently the same; yet the last brings only one-third the price of the first.

The delicate and lighter red wines, the produce of the Gironde, in England generally designated by the term claret, successfully dispute the palm of merit with the Burgundies. Of these, Lafitte, Latour, Chateau Margaux, and Haut-Brion are so deservedly esteemed that they always sell at from 20 to 30 per cent. higher than any others of the department. The first-mentioned is the most delicate, and is characterized by its softness on the palate and its charming perfume, which partakes of that of the violet and the raspberry. The Latour has a fuller body, and at the same time a considerable aroma, but is wanting in the softness of the Lafitte. The Chateau Margaux, on the other hand, is lighter and possesses all the qualities of the Lafitte, except that its flavour is not quite so high. The Haut-Brion has more spirit and body than any of the others, but is rough when new, and requires to be kept for six or seven years in the wood, while the preceding wines become fit for bottling in much less time.

The immense importance of the wine industry to France, and its wide distribution over the country, may be gathered from the facts that it gives employment to no less than 7,000,000 people, and that of the eighty-six departments there are but eight in which wine is not produced, viz.—the seven forming the northern seaboard of France, from Belgium to Cape Finisterre, and the Orne, or the inland part of Normandy. The most productive department is the

Hérault, which yields one-fifth of the entire quantity grown; the Charente-Inférieure stands next, and the Gironde third, the wines of the latter department being those most in demand with foreigners.

Italy, whose climate is so congenial to the vine, with the exception of the Montepulciano and the *Lacryma Christi*, produces but few wines of export much valued, owing to the bad management of the vintage. No attention is paid to the assortment of the grapes, ripe and unripe being thrown into the vat together.

The Greek Archipelago produces many wines of note, which are daily growing into repute on their becoming better known. In Cyprus the grapes are not suffered to lie too numerous on the stock; they are of a rich purple, with a thin skin. The vintage begins at the end of August, or the commencement of September. For the celebrated wine of the Commandery, the fruit is placed on covered floors and spread out with care in a bed of 18 inches thick, where the grapes remain until the seeds are ready to drop from them. They are then carefully lifted with wooden shovels and carried to rooms paved with marble, or covered with cement equally compact. The grapes are bruised with a wooden mallet and pressed, the must, which is very thick, flowing into a vessel on the lower side of the floor; when full the vessel is emptied into small vases, and in these conveyed into baked earthen vessels with aceto bases, like the ancient amphore. In these the wine is left forty days to ferment, in some places with the vat covered while in that state. The art of making these vessels belongs to the remotest antiquity. They hold from twenty to thirty barrels, and in them the lees are deposited. When removed, leathern bags are adopted, pitched on the inside, and of course detrimental to the wine, which does not for many years lose the disagreeable flav. This famous wine, of which about 10,000 jars are now annually produced, was named from the commander of the Knights Templars, to whom the district once belonged. When poured into a glass, if good in quality, the particles adhere like oil to the sides.

The wine of Portugal (called Port wine, from Oporto, its usual port of shipment), forced upon the people of England in 1703 by having been assessed with a duty one-third less than that produced in other countries, drove out many fine wines, of which there was a great variety before, and forced an inferior article upon the public, under the mistaken idea that Portugal would take English woollens in return. At first the wine came in its natural state, but was afterwards sophisticated and brandied, although in the opinion of many analysts there is no more necessity to add brandy to port than sulphuric acid to vinegar. Pure wine was not allowed to be exported, although good and enduring, until the laws of Portugal in 1865 recognized free trade in the article, previously to which it was necessary to add a large percentage of brandy to meet legislative requirements. It is still, however, largely adulterated with brandy, as much as one-third being added to the wine before its shipment to England, the excuse being that without this addition the wine would pass into the acetous fermentation during the voyage.

Madeira was long famous for its fine white wine, but the almost total destruction of the vines by the *oidium* or grape disease, temporarily stopped the trade; it is now, however, beginning to recover. The vines were planted in a volcanic soil, a mixture of red and yellow tufa, with a light clayey earth and volcanic cinders intermingled. A voyage to the East or West Indies is thought preferable for ripening the wine, but formerly this was effected by plunging the bottles, when corked, into a trench of fermenting horse-dung, and by this means in a few months the wine attained maturity.

The wines of Spain are quite distinct from those of Portugal and France, but, with the exception of those made in Andalusia, in which a large amount of British capital is invested, they were, until recently, carelessly

manufactured. That description called sherry is made near the town of Xeres de la Frontera, 9 miles from Port St. Mary's, across the harbour of Cadiz. The highest class of sherries are those which are technically called *dry*, and include Amontillado, Manzanilla, Montilla, and Vino de Pasto. That kind denominated Amontillado is a drier wine than the common sherry, and is often the result of accident. Of a hundred butts from the same vineyard some will be Amontillado, without it being possible to discover the cause. When it is made the grapes are plucked a week or two before those for the other wine, but the treatment is precisely the same. Another species which may be classed under the same denomination, is that called Manzanilla—light, delicate, and straw-coloured. The wines of Malaga are of ancient date, and the vines are grown near sugar-canes, the only spot in Europe where the latter are found. The bastardo grape makes the sweet wine, the *must* being conveyed from the press in a half-fermented condition to the merchant's stores. The dry wines of Xeres and Malaga, as well as those of Teneriffe, were formerly called *sacks*. Owing to the variable climate of this country it is considered necessary before shipment to add adventitious spirit to these wines.

The natural colour of pure sherry is pale or amber, but becomes darker with age; it has a fine aromatic odour, and its taste is warm, with some degree of the agreeable bitterness of the peach kernel. When new it is harsh and fiery; it is mellowed by remaining four or five years in the cask, but it does not attain its full flavour and perfection until it has been kept for twelve or fifteen years.

The province of Valencia produces a great variety of wines. Large quantities of a strong, sweet, red wine, called Benicarlo, from the port whence it is shipped, is exported to Cette; it is thence conveyed by the canal of Languedoc to Bordeaux, where it is mixed with the poorer sorts of the wines of the Gironde, to which it gives colour, body, and durability.

Rhine wines deserve special consideration, on account of the great skill and industry displayed in their production, and the high state of perfection to which the Germans have brought their vineyards. The best of the Rhine wines are all white. There is one red species called Assmannshausen, of which only small quantities are produced, but the wine is of rare merit. The true characteristics which distinguish the good wines of the Rhine are, however, to be found in no others. The bouquet is as distinctive as the scent of mignonette, or any other particular flower possessing a compound odour. The flavour is equally remarkable, added to which there is a *raciness* which conveys a quickening relish to the palate and appetite. The odourance of these wines is astonishing; some of them known to have been made in the year 1616, are still perfectly sound after a lapse of over two centuries and a half.

The Austrian Empire produces some unique and very excellent wines, prominent among them being those of the Voslan, situated southward of Vienna, between the Hungarian Mountains and the slopes of the Styrian Alps. The Voslan wines are widely different from other Austrian and Hungarian growths, being distinguished by their superior smoothness and fullness of body, and resemble the finer class of the so-called Burgundy clarets. Of Hungarian wines the annual produce is estimated at 360,000,000 gallons. The names of the principal sorts of the white wines are Somlan, Neszmély, Oedenburg, Ruszter, Bakator, and Tokay; of the best red wines, Erlau, Ofen, Ménes, Gutowitz, Szegszár. Finest of all these wines is Tokay, so called from a town near the place of its production, on the Theiss, about 45 miles N.N.W. from Debreczin, and which consists of three varieties—viz., the Essence, flowing spontaneously from the ripest grapes; the Ausbruch, obtained by pressing the over-ripe grapes; a small quantity of good new wine or *must* being at the same time added in

varying proportions to fresh must; and the Maslas or inferior variety. Of these varieties, the first, which is in the highest degree sweet and luscious, is more sought for as a rarity than as being pleasant to the palate. Gemine Tokay is scarce and of enormous price, and but little ever finds its way to England. Until the last few years, on the occasion of the reduction and assimilation of the customs duties on wine, neither Austrian nor Hungarian products were much known to the English public; but a taste for them is daily increasing, and it is probable that in the course of time, with a moderate tariff of prices, some of them may compete with claret, hock, and champagne.

From 1700 to 1785 the quantity of foreign wine imported annually never varied far from 2,000,000 to 3,000,000 gallons; from 1786 to 1851 it varied from 4,000,000 to 11,000,000 gallons. The Portuguese wine (port) maintained an ascendancy over Spanish (sherry) till about 1830, after which year the latter advanced, and the imports of it have now become nearly twice as large as those from Portugal.

The following table shows the quantity imported in 1887:—

		Value
From British possessions in		£
South Africa, . . . .	48,415	17,699
Other British Possessions, . .	168,188	36,606
From Germany, . . . .	102,188	59,820
Holland, . . . .	418,864	290,836
France, { Red, . . . .	3,895,281	1,052,678
{ White, . . . .	1,774,593	1,732,018
Portugal, . . . .	3,451,156	1,063,203
Madeira, . . . .	91,054	36,106
Spain, { Red, . . . .	1,486,859	198,788
{ White, . . . .	2,943,761	813,233
Italy, . . . .	530,789	110,821
Other countries, . . . .	164,948	56,069
[ Of Wine, . . . .		15,379,126
Total, . . . .		
{ Red, . . . .	9,477,560	2,414,321
{ White, . . . .	5,901,566	3,023,556

The total amount of customs duty paid was £1,093,576. Over 1,000,000 gallons of wine are annually exported from this country, the largest quantities being sent to India, Australia, and the West Indies.

The duty levied upon all wine, from whatever country, is now in proportion to its alcoholic strength—not exceeding 30 degrees proof spirit, 1s. per gallon; over 30 degrees, and under 42 degrees, 2s. 6d.

#### WING-SHELL. See STROMBIDE.

**WIN'KELRIED, ARNOLD VON**, a Swiss, of the canton of Unterwalden, lives in history by his heroic devotion at the battle of Sempach (1386) fought by 1300 Switzers against four times the number of Austrians, under their duke, Leopold. The serried Austrian phalanx of spearmen seemed impenetrable, when Winkelhied, exclaiming, "Comrades, I will make a lane for you," gathered a sheaf of the extended Austrian spears in his arms and permitted them to be forced into his breast. The lane was made, the Switzers fought their way into it, and gained a decisive victory.

**WIN'NIPEG**, a rapidly increasing city of Canada, the capital of the province of Manitoba, is built at the confluence of the Red and Assiniboine rivers, about 40 miles north of the United States boundary. It was originally known as Upper Fort Garry, and has grown up round the old fortification—a portion of which still stands—in a few years from a mere hamlet to a fine city. Fort La Rouge, built by De la Verandrye in 1731, stood opposite Fort



Garry, on the south bank of the Assiniboine. It was a trading post of the Hudson Bay Company until 1783.

In 1870 Winnipeg contained a population of only 253. Incorporated in 1873, the number of its inhabitants had risen to 2200. In 1887 its population was estimated at from 28,000 to 30,000. It is a well-laid-out handsome city, with good wide streets and brick and stone buildings, with a handsome post office and city hall, numerous churches (including a Roman Catholic cathedral), a Parliament House, and several banks. There are English Church, Presbyterian, and Roman Catholic colleges, and a Wesleyan Institute. Winnipeg has good railway communication with all parts of Canada.

**WINNIPEG, LAKE**, in British North America, situated in Manitoba, is 850 feet above the sea. It is of very irregular shape, particularly in the south. The length from N.W. to S.E. is 305 miles; the breadth varies from 5 to 70 miles. The waters are muddy, and the shores are low; the south banks are well wooded, while those on the north are composed of naked rock. The lake receives the Saskatchewan and the Red River, and discharges its surplus water through the Nelson, by a chain of smaller lakes, into Hudson Bay.

**WINSTANLEY.** See EDDYSTONE.

**WINTER** (probably the "wet season," and allied to *wt*, see Lithuanian *vaudis*, water; and Sanskrit *und*, to wet), the fourth season of the year. The earth is at this period nearest to the sun, but owing to the obliquity of the solar rays and the extreme length of the nights, its temperature in the northern hemisphere is lower than at any other time. As with the other seasons, so here also with winter, we venture to add Spenser's wonderfully beautiful description from the "Faerie Queene": -

"Lastly came Winter, clothed all in frize,  
Chattering his teeth for cold which did him chill;  
Whilst on his hoary beard his breath did freeze,  
And the dull drops, that from his purpled bill  
As from a linbeck did adown distill.  
In his right hand a tipped staff he held,  
With which his feeble steps he stay'd still;  
For he was faint with cold, and weak with eld,  
That scarce his loosed limbs he hable was to weld."

But the winter cold which drives us during the long nights to the fireside has its wondrous compensations. Winter is admittedly the merriest time of the year. Out of doors we may go our various ways; indoors we are compelled to be social. This is the season for games, for music, for dancing. It is also the chosen time for reading, for study, for serious talk. In summer the body rules, in winter the mind. The most universal festival among us, that of Christmas tide, crowns the year, with suggestions of peace on earth and good-will towards man.

Our scientists (and the French republican calendar went with them while it lasted) begin the winter with the winter SOLSTICE, 21st December. But the popular division takes November, December, and January as the winter months, and regards Christmas and the solstice as mid-winter. Our winter is three days shorter than our summer, which combines with our nearness to the sun in winter to give us a much milder winter than that of our antipodes. See SUMMER.

**WINTER-GREEN** (*Pyrola*) is a genus of plants belonging to the order ERICACEÆ, tribe Pyroleæ. The species are natives of the temperate parts of the northern hemisphere, inhabiting woods, and several are natives of Britain. They are herbs with simple leaves resembling those of the common pear tree, and racemose or solitary flowers with five persistent sepals, and a corolla of five petals, slightly united at the base. The name is given in North America to several species of the nearly allied genus, *Chimaphila*, half shrubby plants, with shining evergreen leaves and beautiful fragrant flowers. The leaves contain

a bitter extractive principle, on which account they are used in medicine. The volatile oil known as oil of winter-green, and used medicinally and for flavouring syrups, is obtained from another species of Ericaceæ, *Gaultheria procumbens*, a native of North America. See GAULTHERIA.

**WIRE** is metal elongated into the form of a slender rod, generally cylindrical, but not necessarily so. In early times metals were probably beaten out with a hammer into thin plates or leaves, which were then divided into small slips by means of scissors or some other cutting instrument, these slips being subsequently rounded by a hammer and a file so as to form threads or wires. Such a view agrees with the account given in Exod. xxxix. of the dress of the high priest, and with the account of the net of wire made by Vulcan to ensnare Mars and Venus, described by Homer. The earliest known mention of "wire drawers" and "wire-millers," as those who produced wire by drawing were variously called, occurs in 1351 and 1360 in the histories respectively of Augsburg and Nürnberg, the previous accounts being only of "wire-smiths," or those who fabricated wire with the hammer. The precious metals appear to have been the first subjected to this process, but blanchied iron wire or white wire is mentioned in a list of articles the importation of which into England was forbidden in 1463. Up to 1565 English iron wire was drawn by hand only, and was of so poor a quality that most of that used in the country was imported, but in that year an improved process was introduced by certain Dutchmen or Germans. In 1630 the manufacture of wire is spoken of as an important industry to be protected against foreign competition, and during the seventeenth century it assumed considerable dimensions about Barnsley in Yorkshire.

The facility with which a metal may be drawn into wire is called its ductility, and that property is greatest in gold, after which among the more familiar metals come silver, platinum, iron, copper, zinc, tin, and lead. The metals which are more commonly made into wire are iron, including steel, copper, with some of its alloys, especially brass and silver, with gold-plated silver for the so-called "gold wire." In the making of iron wire, which may stand as a type for all the rest, wrought metal of the best and toughest quality is selected. This is made up first in the shape of small rods, which are prepared for the final drawing by means of rollers, which are generally 7 or 8 inches in diameter, and may perform as many as 350 revolutions to the minute. A bar of metal heated to redness is passed between the rollers, through grooves successively diminishing in size until it is reduced to the thickness of an eighth of an inch, rods of this size being themselves used as wire for some purposes. The cast-steel wire for the best needles and some similar articles is prepared for drawing with the hammer in preference to submitting it to the rolling process. But however the metal may be prepared, and in whatever manner the drawing may be performed, this latter operation is in all cases essentially the same in principle. Very commonly the draw-plate is a piece of hardened steel, about 6 inches long and  $1\frac{1}{2}$  thick, flattened on one side, and slightly tapered toward the ends. From the flat side of this plate, at which they have their larger extremity, to the opposite side, several conical holes are pierced, their smaller orifices being carefully finished to the sizes they are respectively intended to give to the wire drawn through them. In the French factories the draw-plate consists of a compound bar, one part being of wrought-iron and one part of hard steel. Through the holes in the draw-plate the wire is drawn, the orifices being made successively smaller until the requisite gauge is obtained. Whether wire is drawn by machinery or by hand, after a few drawings, the number of which decreases as the size diminishes, it becomes brittle under the process and requires annealing. To protect it from the film of oxide which would otherwise



form upon its surface, it is dipped into a scour bath of weak sulphuric acid and sulphate of copper, whereby it gets a thin protecting coating of copper on its surface. The latter also plays the part of a lubricant to the iron, and it is easily removed in connection with the final annealing. With most descriptions of wire grease also is commonly and freely used, and with the finer sizes wax, for lubrication. For very fine wire draw-plates jewelled with rubies and other precious stones are employed. With a plate having a hole pierced through a ruby of 0.0033 inch in diameter a silver wire 170 miles long has been drawn so nearly uniform that neither measurement with the micrometer nor the weighing of equal lengths at the two ends showed any difference in size. Dr. Wollaston coated threads of platinum with silver, and after drawing them into exceedingly fine wire, removed the silver by nitric acid, and thus obtained a wire calculated to be only  $\frac{1}{300,000}$  of an inch in diameter. Of such a wire a length of a mile would weigh but a grain, and 150 filaments in close contact would barely equal the size of an ordinary filament of raw silk. These wires were intended to take the place of the "spider lines" in the telescope. Actual gold wire is used for very few purposes, but that which is commonly known as gold wire, and which is really silver gilt, strikingly exemplifies the extreme ductility of the precious metals. A silver rod an inch in diameter is coated with leaf gold, and by drawing and annealing this rod is then reduced to the finest wire required; and though in the outset but 100 to 140 grains of gold are thus allowed to a pound of silver, the wire produced is still completely coated. Such wire is wound upon thread to form gold thread, the economy as well as beauty of the product being increased by previously flattening the wire between steel rollers. Brass wire also is made so fine, even by the ordinary processes, that gauze may be woven from it which shall have 67,000 meshes to the square inch.

Wire is applied to a great variety of uses, among which is that of the manufacture of wire gauze or cloth. The plainer sorts of wire gauze or network are woven on looms differing but little from those for cloth. Those of large wire and open meshes are employed for cages, coarse needles, or sieves, &c., while the finer sorts are used in the construction of fine sieves, lanterns, flour-dressing machines, paper-making machinery, screens, safety lamps, &c. Knitting and sewing needles and pins are first cut from wire expressly prepared for such manufacture, and some of the finest sorts of steel wire are consumed in making the hair springs of timepieces. For the making of wire into wire rope see BRIDGE and ROPE, and for the use of wire in telegraph lines see TELEGRAPH. The exports of wire from the United Kingdom in 1887 were 46,110 tons; value, £629,975. In addition to this telegraphic wires and apparatus connected therewith were exported to the value of £17,197.

**WIRE WORM** is the name given by farmers and gardeners to the destructive larvae of the skipjack or click beetles, forming the family *ELATERIDÆ*. These larvae are long, slender, cylindrical, and covered with a tough skin, with the head and last joint horny. Some species pass three years in the larval state. Wireworms frequently do great damage to crops of corn, as well as to potatoes and various kinds of roots. Rooks, pheasants, and other birds devour great numbers of wireworms, and various means are resorted to by agriculturists for the destruction of these pests.

**WISBEACH** or **WISBECH**, a municipal borough and port of entry of England, in the county of Cambridge, is situated chiefly on the eastern bank of the river Nene, 23 miles north by west from Ely, and 87 from London. The river is crossed by an iron bridge. The houses are tolerably good, and the streets are clean. A handsome

circus occupies the space where the castle of Wisbeach formerly stood. The town has a corn exchange, town hall, built in 1873, a cattle market, and two banks. The parish church, dedicated to St. Peter and St. Paul, is a large and ancient structure. It contains some old monuments, a handsome modern reredos, and some good stained-glass windows. There are places of worship for Baptists, Methodists, Independents, Roman Catholics, and Quakers, and a free grammar-school. A cottage hospital was erected in 1873. It overlooks the park or recreation ground, which is 18 acres in extent, and very tastefully laid out. There is a museum of natural history and antiquities, in which are many objects found in the peat of the fens, such as canoes, hatchets, and bronze swords, relics of the ancient Britons, together with Roman remains. A tabernacle cross by Sir G. G. Scott, to the memory of Thomas Clarkson, was unveiled in 1881. The town has a busy and thriving appearance. It contains large timber yards, planing and sawing mills, breweries, rope-walks, coach-building, and agricultural implement works, and yards for repairing and building barges and ships. The navigation of the Nene to Wisbeach has been much improved, and vessels of 500 to 600 tons can get up to the town. The quays in the town have also been improved and new warehouses built. The imports are chiefly timber and cereals.

Wisbeach is the centre of a large and increasing fruit growing district, quantities of apples, pears, plums, currants, raspberries, gooseberries, &c., being grown for the London and north of England markets. The municipal borough is divided into two wards, and is governed by a mayor, six aldermen, and eighteen councillors. The population in 1881 was 9218.

Wisbeach derives its name from the river Ouse, formerly pronounced as the French *On ise* or *Wis*, "the beach of the Ouse-ise," but many authorities consider the *beck* as derived from *beck*, a stream, signifying the Ouse stream; the river, before the drainage of the fens, covering a great extent of country. In the Saxon times the Isle of Ely abounded with religious establishments, the most notable of which were the Cathedral of Ely and Thorney Abbey, when Wisbeach appears to have been given by Oswy and Leofde, the parents of Alwin, bishop of Elmham, to the monastery of Ely. The isle became the last refuge of the Saxons who held out against William the Conqueror, and here, amid the fens and morasses, and under the command of the renowned Hereward the Wake, they maintained for a long period their independence, but were at length subdued, when William erected a castle at Wisbeach to overawe the turbulent people, appointed a governor, who was called the constable, and granted certain lands at West Walton on the tenure of keeping the walls and moat in repair. In the year 1236 it was partially destroyed, with a great part of the town, by an inundation of the sea, and lay in ruins until the fifteenth century, when Morton, bishop of Ely, built a new castle of brick on the site, and made it the episcopal residence. Several of his successors lived in it until the reign of Elizabeth, when it was converted into a state prison for the Catholics who conspired against her government. Between the years 1609 and 1619 Bishop Andrews carried out several improvements and repairs, and on the abolition of the episcopate by the Puritans it was purchased by Thurloe, secretary of state to the Commonwealth, who rebuilt it from designs by Hugo Jones. Very few remains now exist.

**WISBY**, a town of Sweden, the capital of the island of Gothland, in the Baltic, on its northwest coast. It was, in the tenth and eleventh centuries, the principal commercial emporium in North Europe, and long a leading member of the Hansatic League. It is still very interesting to the antiquary, from its numerous ruined churches and other buildings in the old Gothic style.

**WISCONSIN**, one of the United States of America, bounded south by Illinois, east by Lake Michigan, west by the Mississippi, and north by Lake Superior. The area is 53,924 square miles, or 34,511,360 acres. The surface of Wisconsin is very varied, but may be described generally as an elevated rolling prairie, from 600 to 1200 feet above the level of the sea. The highest portion of this plateau is on the north, and forms the dividing ridge between the waters flowing south-west into the Mississippi and those running north into Lake Superior. The southern slope is again interrupted about the middle of the state by another ridge, giving origin to a second slope, drained by Rock River and its branches. There are no mountains properly so called. The descent towards Lake Superior is very abrupt, and the rivers are full of rapids and falls, which interrupt navigation. There is a third ridge or elevation in the south-east, dividing the water-courses of Lake Michigan from those of Green Bay.

Limestone underlies most of the southern part of the state, the cliff limestone in the mineral districts and the blue elsewhere. The northern district seems to be composed of primitive rocks, mostly granite, slate, and sandstone. Part of the great lead region, extending from Illinois and Iowa, is included in the south-west of Wisconsin, and is no less rich in the quantity and quality of its ore than in the other states, besides being intermingled with copper, zinc, and silver; iron also abounds in many places. Marble of a fine quality, some gypsum, saltpetre, and other minerals have been discovered.

*Hydrography.*—Besides the great lakes Superior and Michigan, Wisconsin has a number of smaller ones. The principal of these is Lake Winnebago, south-east of the middle of the state. It is about 28 miles long and 10 miles wide, and communicates with Green Bay (a north-west arm of Lake Michigan) through the Fox or Neenah River. The lakes are most abundant in the north-west, and are generally characterized by clear water and gravelly bottoms, often with bold picturesque shores, crowned with hemlock, spruce, and other trees. They afford excellent fish. The rivers which traverse the interior flow generally in a south-west direction, and discharge their waters into the Mississippi, which runs along the south-west border for more than 200 miles. The most important river in the state is the Wisconsin, which has a course of 200 miles almost directly south, when it flows nearly west for about 100 more. It is navigable for steamboats 180 miles. The Chippewa is about 200, and the Black River 150 miles long. The Rock, Des Plaines, and Fox River (of Illinois) drain the south-east slope of the state, and pass off into Illinois. The St. Louis (considered as the primary source of the St. Lawrence) runs along the state for 20 or 30 miles on the north-west, and is full of rapids and falls in this part of its course.

The climate, though severe and the winters long, is regular, and free from the frequent and unhealthy changes that prevail further south. The lakes exert a mitigating influence, the temperature being 6½ degrees higher on the lake than on the Mississippi side. The lake shore is also more moist, but Wisconsin generally is drier than in the same parallels further east. The soil is well watered and usually fertile.

The country south of the middle of the state is a fine agricultural region. In the mineral district it is broken, but, what is unusual in mining tracts, generally well adapted for farming, and especially grazing. The agricultural capabilities of the northern part of the state, around the headwaters of the Black and Chippewa rivers, and the sources of the streams emptying into Lake Superior, are small, the surface being covered with drift and boulders, or ponds and marshes. Large quantities of wheat (the state being the second in the Union for this crop), maize, rye, oats, barley, potatoes, tobacco, maple sugar, hemp,

flax, hops, &c., are produced, and there are numerous flocks of sheep and herds of cattle.

The wild animals are black bears, prairie wolves, gray wolves, foxes, woodchucks, and the gopher, which is found only on the west side, near the Mississippi River. The last-named animal is very destructive to the roots of fruit trees.

Vast forests of pine occur on the Upper Wisconsin, the Wolf River, and the tributaries of the Mississippi, north of the Wisconsin. The other forest trees are spruce, tamarac, cedar, oak of different species, birch, aspen, basswood, hickory, elm, ash, hemlock, poplar, sycamore, and sugar maple. The park-like oak openings form a pleasing feature in the landscape.

Manufactures have largely extended in recent years, and comprise woollen and leather goods, boots and shoes, saddlery, carriages, hardwares, cigars, machinery, and agricultural implements; also ironworks, sawing and flour-mills, &c. The state has extensive railway connection, and a canal connecting Lake Michigan with the Mississippi, so that it has communication with almost every part of the valley of that river. Wisconsin also enjoys great facilities for internal trade with the lake and eastern states, through those great inland seas which bound it on the north and east. The chief exports are wheat and other grain; and the imports, manufactured articles. The chief town is MADISON.

Ample provision has been made for educational purposes (in grants of land, &c.), and there are numerous schools, besides a university at Madison. The largest religious bodies are the Methodists and the Roman Catholics. The growth of the state has been exceedingly rapid, the population having increased from 30,945 in 1810, to 305,391 in 1850, to 775,881 in 1860, to 1,054,670 in 1870, and to 1,315,497 in 1880. The inhabitants consist chiefly of immigrants from Ireland, Germany, and Wales.

Wisconsin was visited at a very early period by the French missionaries and discoverers, and a settlement was made by the French from Canada in the latter part of the seventeenth century. There was no considerable influx of immigration, however, till quite recently; but this is likely to make up amply for its tardiness, by the unexampled rapidity with which it now flows into the state, invited by its rich soil, valuable minerals, beautiful lakes, and rolling prairies. Wisconsin was formed into a territory in 1836, and admitted into the union as an independent state in 1848.

**WISDOM OF SOLOMON, BOOK OF**, one of the canonical books in the Bible of the Roman Catholic Church, but which is placed by the Protestant churches in the Apocrypha. In the Septuagint the book bears the title "Wisdom of Solomon," and many of the fathers regarded Solomon as its author. It is preserved in Greek and Latin texts, and in subsidiary translations into Syriac, Arabic, and Armenian. Most Protestant scholars consider it to be the work of an unknown Alexandrian Jew, who wrote in Greek between 145 and 80 B.C. It consists of three parts: in the first (chapters i. to v.), the author enjoins wisdom to the rulers of the earth, and praises it as giving happiness and immortality; in the second (chapters vi. to ix.), he shows by what means wisdom may be obtained, and dwells on its essence and blessings; in the third (chapters x. to xix.), he reviews the effects of wisdom in the history of Israel. The book forms a complete and harmonious whole as it stands, but some critics, from the distinct treatment of the different parts of the subject, have maintained that it is the work of two, or even of three authors. The doctrine of wisdom contained in the book appears to mark a further degree of completeness in the conception begun in the Book of Proverbs, and further developed in the later Jewish writings. The book is written in a flowing elevated style, and a competent critic has observed, that the description

of wisdom given (chapters vii. 22 to viii. 1) "must rank among the noblest passages of human eloquence, and it would be perhaps impossible to point out any piece of equal length in the remains of classical antiquity more pregnant with noble thought, or more rich in expressive phraseology." There are numerous special commentaries on the book, among others by Bauermeister (Göttingen, 1828) and Grimm (Leipzig, 1837). The best edition of it is in Fritzsche's "Libri Apocryphici Veteris Testamenti" (Leipzig, 1871).

**WISEMAN, NICHOLAS PATRICK STEPHEN**, Cardinal and Roman Catholic Archbishop of Westminster, was born in Seville, Spain, 2nd August, 1802, of an Irish family settled there. He received his early education in England, and in 1818 he went to Rome, where he entered the English College and graduated D.D. at the age of twenty-two. He was ordained priest in 1825, and two years later was appointed Professor of Oriental Languages in the Roman University, becoming also vice-rector, and in 1828 rector of the English College. As such he extended in 1832 a generous welcome to Lamennais and Montalembert, although they were received with disfavour by Gregory XVI. Returning to England in 1835, he soon became celebrated as a preacher and lecturer, and in 1836 he established, in concert with O'Connell, the *Dublin Review*, a quarterly journal, designed as an organ of the Roman Catholics of Great Britain. In 1840 he was made coadjutor vicar-apostolic of the central district of England, with the dignity of bishop *in partibus*, and president of St. Mary's College, Oscott. The spread of Tractarianism gave him great hopes of the speedy conversion of England to Roman Catholicism, and during two visits to Rome in 1847-50, between which he rose to be pro-vicar and vicar-apostolic of the London district, he urged on Pius IX. the necessity of the re-establishment of the Roman Catholic hierarchy. In 1850 the Pope issued an apostolic letter restoring the English hierarchy, and made Dr. Wiseman Archbishop of Westminster and a Cardinal. The steps gave rise to intense excitement in England, Protestant feeling was fanned to fever heat, and after violent debates in Parliament, an Act was passed prohibiting the use of ecclesiastical titles other than those recognized by the law. The excitement gradually subsided, and the Act has since been repealed. The cardinal, for a time intensely unpopular, conducted himself with great moderation and courage, and by degrees his genuine goodness, wide learning, and high abilities brought about a revulsion of popular feeling, and he was received everywhere with genuine respect. He died in London, 15th February, 1865.

His works, which from their ornate style were more popular on the Continent than in England, include "Horæ Syriacæ" (Rome, 1828); "Lectures on the Connection between Science and Revealed Religion" (two vols., Lond., 1836); "The Real Presence" (1836); "Lectures on the Doctrines and Practices of the Catholic Church" (two vols., 1836); "Four Lectures on the Offices and Ceremonies of Holy Week" (1839); "Three Lectures on the Catholic Hierarchy" (1850); "Essays on Various Subjects" (three vols., 1853); "Fabiola, a Tale of the Catacombs" (1855); "Recollections of the last Four Popes" (1858), and several volumes of sermons.

**WISMAR**, a seaport town of North Germany, in the grand-duchy of Mecklenburg-Schwerin, at the head of a bay of the Baltic, 17 miles north of Schwerin. It is curiously built in the antique style, has a good harbour, and considerable export trade. There is railway communication with Hamburg and Rostock. Population, 15,000.

**WISTARIA** is a genus of plants belonging to the order *LEGUMINOSÆ*, suborder *Papilionacæ*. The species are deciduous twining shrubs, natives of North America and China. They grow vigorously in Great Britain, and form when in flower the handsomest ornaments of our gardens.

*Wistaria frutescens* is found from Virginia and Illinois, to Florida and Louisiana, in boggy places. It is an elegant climbing plant, growing to a height of 20 or 30 feet, with racemes of fragrant bluish-purple flowers. *Wistaria chinensis* is a native of China, which, on account of its rapid growth and hardy habits, has become very common in England, and is scarcely less a favourite than the laburnum. Its flowers are larger and paler in colour than those of the American species, and are produced in longer and looser racemes. Both species are readily propagated in this country by layers and by cuttings of the roots.

**WIT'AN** or **WIT'ENAGEMOT'** (*witena*, genitive of *witan*, wise men, and *gemot*, assembly), the original council of the kingdom before the Norman Conquest.

The witenagemot grew out of the tribal council of our English forefathers, such as Tacitus describes in his "Germania," and was always of great power under our early kings. In fact it preceded the kingly office as an instrument of government, and it was not until the conquest of Wessex and the evident necessity for the permanent chieftaincy of Cerdic that Englishmen suffered their cherished assembly to become the second power in the state. Each kingdom, as it was defined during the English Conquest, changed its main assembly into a witenagemot. Again, the next departure came from Wessex, for its supremacy over all England in 827, under Egberht, speedily reduced the witan of the subordinate kingdoms into mere local courts, while the great witan of Wessex became the national council of England. It remained in theory open to all men, but in practice it was already limited to the chief men of the country, those whose duties kept them near the king's person or the court.

Its name (*witan*, wise men), also, indicates that it was an aristocratic or senatorial body, for aristocracy means the government of the best (Gr. *aristoi*), and a senate is but an assembly of aged men (Lat. *senes*). All these words came to lose their precise verbal significance, and took on the meaning of what we now call a House of Lords. The witan, from the first time we hear of it, had already become quite distinct from the folk-moot or assembly of the people.

The witan met at first usually twice a year, oftener in stormy times, and in the last century before the Norman Conquest thrice a year, at Easter, Whitsuntide, and Christmas. Its numbers varied from 20 to 100. Taking as an example the witenagemot at Winchester in 934 we find present the king (Athelstan), four Welsh kings, two archbishops, seventeen bishops, four abbots, twelve ealdormen (equivalent to Norman barons), and fifty-two thegns or lords—ninety-two in all. Women sometimes attended—for instance, the king's mother, abbesses, &c. The members of the witan were specially protected, by a law of Ethelbert (600), when going to and from the meetings.

The powers of the witan were theoretically enormous, but as time went on the king, through his thegns, practically controlled the decisions, and indeed some time before the Norman Conquest the witan had quite taken the character of a king's council.

The earlier powers of the witan—and in theory the actual powers down to the Norman Conquest—were these:

1. The right of electing the king. Harold, Edgar the Atheling, and William the Conqueror were all successively elected by the witenagemot in 1066, the latter election being the last act of the witan. The custom was always to choose the eldest male representative of the royal family if of full age and capacity. The only exceptions are Cnut the Great, 1017, and Harold II., 1066.
2. The right of deposing the king, frequently exercised; for instance, Ethelwulf, 857; Edwy, 957; Ethelred II., 1016 (restored 1014); and Harthacnut, 1037, in favour of Harold I. Harthacnut succeeded Harold, eventually, in 1040.

3. The right of granting folk-land, the national property, at first exclusively, then conjointly with the king; then, the right of grant having been assumed by the king (even as early as Alfred the Great occasionally, and later on perpetually), changing this to the right to confirm the royal grants. But folk-land was in actual practice almost synonymous with crown land even before the Conquest, and was formally converted to crown land by William the Conqueror.

4. The right of declaring war and of making treaties; e.g. the peace of Wedmore in 879 is expressly stated to be the work of the king "and the witan of all the English nation."

5. The right of regulation of tithes and approval of other taxation proposed by the king; thus, "I, Alfred, king of the West Saxons, showed these laws to all my Witan, and they said that it seemed good to them all to be holden." (Stubbs, *Sel. Charters*, 62.)

6. The right of appointment and removal of state officers, both secular and ecclesiastical, conjointly with the king.

7. The right to provide for and maintain the defences of the realm.

8. The right of final judgment, especially judgment of what we should call attainder. This is shown by the outlawry of Sweigen in 1050 and of the whole of the Godwine family in 1051 by the witan, followed by the passionate reinstatement of the great ruling family when the deceit was discovered, and the outlawry of the Norman favourites of the Confessor who had thus deceived the people to their hurt, 1052.

Under the Norman kings the witenagemot, shorn of most of its great powers, became the Great Council, *Magnum Concilium*, a feudal court based upon the occupation of land. It continued, like the witenagemot, for some time, nominally to elect the king (e.g. William Rufus, Henry I., Stephen, Henry II.), and did not entirely become feudalized until the reign of Henry II. For its further history see COUNCIL (THE KING'S) AND PARLIAMENT.

**WITCHCRAFT** (derived from the Saxon *wicca*, witch; and *craft*, art or cunning) signifies, in the largest sense of the term, the use of all kinds of sorcery, charms, divination, incantation, prediction of the future, and intercourse with evil spirits, real or pretended. The notion that men or women may, by certain occult practices, obtain abnormal power over the forces of nature, and over the unseen spirits supposed to inhabit the elements, dates from a very remote period in human history, and it is yet in some of its forms the belief of the great majority of the human race. In the ruder forms of savage life of to-day, where terror is the mainspring of such religion as exists, we find a belief in the reality of witchcraft deeply seated and universal, and it is often accompanied by rites and punishments of peculiar atrocity. The savage traces the misfortunes and calamities which he cannot comprehend to the agency of supernatural beings, before whom he crouches and trembles, and whom he strives to propitiate. Where all men believe this, ambition, vanity, or even the accidental coincidence between some propitiatory act and the desired result, may tempt some man to feign that he is in communication with these supernatural beings, and that he has the power of rendering them propitious or adverse. He thus readily acquires great authority and influence, and so it comes to pass that ignorance, imagination, superstition, and imposture blend and combine in creating a belief in the intercourse between men, the spirits of the departed, and supernatural beings, and in witchcraft as one of the chief manifestations of this influence. In ancient times the Chaldeans and Persians were celebrated for their skill in divination and enchantment; and the Egyptians from a very remote period were famous for their proficiency in sorcery. Testimony to the latter circumstance may be

found in numerous references in the Old Testament, the most striking being that given in Exodus, where the writer represents the Egyptian magicians as contending successfully for a time with Moses and Aaron, and working some remarkable miracles by their "enchantments." The extant literature of ancient Egypt also affords copious information concerning the important place taken by magic in its religious and social life, and in common with all nations who practised magic generally, the Egyptians distinguished between a lawful and an unlawful kind. The Canaanites were strong believers in magic, and the Hebrews seem to have been addicted to it from the beginning of their history as a nation until long after their dispersion by the Romans. With the development of the worship of Jehovah, however, and the acceptance of the more lofty ideas concerning his nature and attributes introduced by the prophets, all forms of magic fell into disrepute and under the condemnation of the law. In Deut. xviii. 10, 12, there is a comprehensive prohibition given, which seems designed to include every kind of magical art:—"There shall not be found with thee any one that maketh his son or his daughter to pass through the fire, one that useth divination, one that practiseth augury, or an enchanter, or a sorcerer, or a charmer, or a consulter with a familiar spirit. For whosoever doeth these things is an abomination unto Jehovah." It is evident, however, that the Hebrews had no doubt as to the reality of witchcraft, for elsewhere we find the punishment of death assigned to those who practised it, and the prophets who denounce the practice appear to recognize it as a real offence. By many the curious story of the visit of Saul to the witch of Endor is regarded as evidence of the belief of the writer in the reality of witchcraft, but upon this point commentators are not agreed. The Greeks borrowed their magical rites from the East, while Roman magic was of Etruscan origin; but neither under the sway of Greece nor Rome do we find holocausts of victims offered up, as afterwards in Christendom, on the altars of a cruel and degrading superstition. The belief, however, was general that it was possible for human beings to inflict evils of various kinds upon their species through supernatural agency. This was admitted by all the different sects of philosophers, the Epicureans only excepted. In Rome, the Decemvirs passed a law condemning magicians to death; a similar law existed in the early days of Greece; and in the time of Demosthenes a sorceress, named Lamia, was actually put to death. But upon the whole, the persecution of witches and sorcerers among the ancients seems to have been singularly free from fanaticism. "The magician was punished," as has been well remarked, "because he injured man, and not because he offended God." The pagans, too, distinguished between good and bad magic; whereas, according to the Jewish and the Christian systems, all demons are evil spirits, and all intercourse with them is idolatry and heresy worthy of the severest punishment. The *Lex Cornelia*, one of the Roman laws usually cited against witchcraft, was also aimed against poisoning, and its occasion and cause were the conviction and condemnation of 170 Roman ladies for poisoning under pretence of incantation.

In the New Testament we find very little reference to witchcraft, though the Apostles were encountered in more than one place by magicians, as in the case of Simon Magus and Elymas, while at Ephesus the influence of Christianity effected a great reformation among those who practised magical arts. In Galatians v. 20, "sorcery" is enumerated among the works of the flesh. Constantine, the first Christian emperor, permitted the exercise of magic whereby the fruits of the earth or the health of the body might be benefited; but punished with death the use of noxious charms and incantations. The first great persecution for witchcraft and sorcery in Christian times took place towards

the close of the fourth century, shortly after the final division of the empires of the East and West, in the reigns of Valentinian and Valens. It raged most hotly at Rome and Antioch, but was also extended throughout the Roman world.

In the sixth century, the Emperor Leo issued a rigorous edict against witchcraft and sorcery, and by that period the notion that people might make a bargain with the devil, and sell him their souls in return for power or pleasure in this life, had become fully established. The Emperor Charlemagne severely punished those accused of the crime of witchcraft, and many such persons were burned or broken upon the wheel during his reign. Witch trials, however, were comparatively rare up to the fourteenth century, when many circumstances combined to bring the subject to the front, and cause it to assume great importance in the public mind. Chief among these influences was the growth of heresy, which disturbed the peace of the church, and was regarded along with witchcraft as being the work of the devil. Very soon the two things became associated according to the declarations of the clergy, and heretics were not only accused of errors of doctrine, but also of being in league with the devil, and with practising sorcery by his aid. As a result, prosecutions of witches and wizards quickly multiplied, and at last, in 1484, Pope Innocent VIII. issued a bull formally denouncing witchcraft, and empowering inquisitors to seek out and burn all who were guilty of it. The bull was specially directed to Germany, and here two inquisitors, Heinrich Institor and Jacob Sprenger, with the aid of a priest of Constance, Johannes Gremper, drew up the famous work entitled "*Malleus Maleficarum*," or "*Hammer for Witches*," the first edition of which appeared in 1486. In this book, which starts from the proposition that the devil was everywhere gaining ground, and that witchcraft was being practised everywhere, the whole doctrine of the black arts was systematized, and a course of examination appointed for the discovery of the guilty. In the system of examination every advantage was given to the accuser against the accused, and torture was freely applied to those charged with witchcraft, in order to make them confess to their guilt. Under the stress of horrible pain many confessed anything to obtain relief, and these confessions were published as indubitable evidence of the spread of witchcraft. Brooding over the astounding wonders and iniquities thus laid bare, many persons of weak intellect imagined themselves or their neighbours to be witches or wizards, and thus the mania increased until it assumed awful dimensions. The accounts of the numbers executed for the crime of witchcraft almost surpass belief, but there is no doubt that during the close of the fifteenth and the opening years of the sixteenth centuries, many thousands of persons of both sexes were annually burned for this imaginary offence. In some districts the witch trials inaugurated a veritable reign of terror; parents accused their children and children their parents, wives gave evidence against their husbands, and husbands dragged their wives before the tribunals of the inquisitors, and the unhappy victims were hanged or burned in batches until the frenzy moderated. In the small bishopric of Bamberg 600 persons were executed for the crime of witchcraft in four years, and during the same period the bishopric of Würzburg witnessed 900 executions for the same offence. In Geneva 500 persons were burned within three months (1515-16), while on one occasion at Toulouse 400 were burned in one day. Nor was the mania checked by the Reformation, for Protestants as well as Catholics believed in the reality of witchcraft, and regarded it as a crime deserving the severest punishment. Concerning witches, Luther observed, "I would burn them all," and Archbishop Cranmer directed his clergy to make inquisition for all that used charms, sorcery, enchantments, and witchcraft. The earliest statute against witchcraft in England was enacted

in the reign of Henry VI., and additional penal laws were passed by Henry VIII. and Elizabeth; but it was not until the reign of James I., that sapient monarch

"In quilted doublet, and great trunk breeches,  
Who held in abhorrence tobacco and witches,"

that witch prosecutions in this country assumed as gigantic proportions as those on the Continent. James' "*Demonologie*" was published at Edinburgh in 1597; and in 1604 the English Parliament passed the Witch Act, which subjected witches to death on the first conviction, even though they should have inflicted no injury upon their neighbours; and these two were as fatal to witches among Protestants as the bull of Innocent VIII. and the "*Malleus*" of Sprenger were among Catholics. The "*Demonologie*" makes a great parade of abstruse and pedantic learning, but is full of folly and injustice; laying down among other things that any and every evidence is good against an exceptional crime like that of witchcraft, and that the testimony of the youngest children and of the most infamous persons ought to be received.

During the first year of the reign of James a Parliament which included Coke and Bacon passed a law dooming witches of all kinds to death, even though they had avoided injuring their neighbours, and under this Act executions for witchcraft soon became common. After a few years a frenzy of terror seems to have passed over England, and the people turned upon those who were suspected with savage ferocity. The executions increased in number and frequency, and persons charged with the offence of witchcraft, generally selected from the defenceless, old, and poor, were subjected to cruel tortures to force them to confess. During the sitting of the Long Parliament it is computed that no less than 3000 persons were executed for witchcraft, the majority coming from the Presbyterian eastern counties.

The belief in witchcraft prevailed among the best intellects of the period, and we find in 1661 Sir Matthew Hale tried and condemned two women named Amy Dunny and Rose Callender at Bury St. Edmunds for bewitching children, and Sir Thomas Browne, who was present at the trial, gave strong evidence against the prisoners. Nor were matters a whit better during the same period in Scotland; and in that country the variety and cruelty of the tortures inflicted upon the accused to compel confession were absolutely frightful. The mere account of them, as given in Pitcairn's "*Criminal Trials*" and elsewhere, is sickening to read. Witches were tormented by having pins thrust into their flesh, and by being kept awake night after night; by having their legs, arms, and fingers tortured in the boots, caspice-saws, and pilniewinks, till often the blood and marrow spurted forth; and by being scourged with cords till the skin and flesh were torn from the bones. The General Assembly passed repeated condemnatory acts against witchcraft between 1640 and 1660, and the clergy busily hunted out those whom they considered guilty of the crime. At a single circuit held in Glasgow, Stirling, and Ayr in 1659 seventeen persons were convicted and burned as witches, and the total number of victims in Scotland from first to last is estimated to reach no less than 4000.

From Great Britain the delusion passed over to New England, and between the years 1648 and 1692 over forty persons fell victims to it. The most famous incident in connection with the New England madness was the trial of the Salem witches in 1692. On this occasion nineteen persons, among them some of the most pious and reputable citizens, were hanged, six being men, including one clergyman, and thirteen women. Giles Carey, a farmer, upwards of eighty years of age, for refusing to plead, was pressed to death. A revulsion of public feeling took place after this butchery, and the following year the remainder of the accused, about 150 persons, were released by the governor.



During the eighteenth century, while the belief in the reality of witchcraft remained, the public spirit underwent a change, and prosecutions became fewer until they ceased altogether. The last judicial execution for witchcraft in England took place in 1716, when a Mrs. Hicks and her daughter, aged nine, were hanged at Huntingdon for the crime of selling their souls to the devil, by whose aid they were enabled to raise a storm by washing their stockings with soap. In Scotland an old woman was put to death as a witch in 1722; in Germany executions continued until 1756, in Spain until 1780, and in Switzerland until 1782. The latest instance of a judicial execution for witchcraft in Europe is believed to be one which occurred in the grand-duchy of Posen in 1793. The laws against witchcraft in England were formally repealed in 1734, but as late as 1773 the Scottish divines of the Associated Presbytery publicly declared their belief in witchcraft, and even John Wesley asserted concerning this belief that "giving it up is in effect to give up the Bible." Among the peasantry the belief in witchcraft still lingers, and at occasional intervals we hear of persons being assaulted, or even murdered, for the offence of bewitching their neighbours. On the Continent the belief is even more widespread among the uneducated masses, and in semi-civilized and uncivilized countries it still retains its pristine vigour. Among many African tribes the belief in witchcraft, good and bad, is the most potent spiritual influence known, and while the methods of the witchfinders and witch-doctors among them bear a curious family likeness to those which prevailed in Europe three centuries ago, the cruelties practised in Europe to which we have referred, are surpassed by the barbarities inflicted upon the unhappy victims of the superstition to-day.

The literature upon this subject is extensive and voluminous. Among the works written by defenders of the belief in witchcraft, see, in addition to the "Malleus Maleficarum" and "Demonologie," Dr. Glanvil's "Sadducismus Triumphatus, or Full and Plain Evidence concerning Witches and Apparitions" (London, 1689), and Richard Baxter's "Certainty of the World of Spirits." Against the superstition the earliest writers were Johann Wier, the author of "De Præstigiis Dæmonum" (Basel, 1563), and Reginald Scot, a thoughtful and learned Englishman, whose "Discoverie of Witchcraft" first appeared in 1584, and was reproduced in facsimile with wonderful accuracy by Nicholson in 1884, the centenary of its original publication. So much was Scot in advance of his age that his book was ordered to be burnt by the common hangman. Among modern works which deal with the history of the superstition those of Michelet, Buckle, Lecky, Lowell, and Tylor may be consulted.

**WITCH-HAZEL.** See WYCH-HAZEL.

**WITENAGEMOT.** See WITAN.

**WITHER, GEORGE**, the poet, was born in 1588 in Hampshire, and was the son of a country gentleman of that county. He studied at Oxford, and then was intended for the law. In 1613 appeared, not his first, but the first of his more notable publications, the "Abuses Stript and Whipt," a satire on the times for which he was imprisoned. During this imprisonment he wrote not only an indignant "Satire to the Kings," but his "Shepherd's Hunting," one of the most pleasing of his pastoral performances. His pen became now very prolific both of prose and verse, and he grew to be considered by the Puritans one of their chief literary champions. His Psalms, in verse, 1632, and his "Emblems," in 1635, were written while yet he was the king's friend. But he, like most patriots, soon detected Charles's real nature. On the breaking out of the Civil War in England, he espoused with zeal the side of the Parliament, and to raise a troop of horse sold the patrimony which he had meanwhile inherited. At the Restoration he was impoverished and imprisoned, and he died in 1667.

Wither is a most unequal writer; hence the exaggerated depreciation and appreciation which he has received. His "Hymns and Songs of the Church" were edited, with an introduction, by Mr. Edward Farr in 1856.

**WITHERS**, the ridge between the shoulder-blades of the horse, the part he opposes to his load, where the stress of the collar comes in drawing (Old English *wither*, opposed to, the same word as the German *wider*). The German word is *wider rist*, rist being equivalent to ridge; hence the *s* in our withers. The pressure on the withers, if the collar is not well fitting, may cause soreness, as Shakespeare well knew:

"Let the galled jade wince, my withers are unwrung."  
—*Hamlet*.

Horses are measured as to their height at the withers.

**WITNEY**, a town of England, in the county and 10 miles N.W. of Oxford, and 75 miles from London by rail. It has an old church, a town-hall, county court-house, a blanket hall, and an old market cross. It has long been famous for its blankets, and has glove-making and other industries. The population in 1881 was 3017. Witney is of great antiquity, and its manor is stated to have been one of those given to the monastery of St. Swithun, Winchester, in the reign of Edward the Confessor.

**WITTENBERG** (the "wooden castle"), a town of Germany, in Prussian Saxony, in the government of Merseburg, situated on the Elbe, 52 miles S.S.W. of Berlin. The town is not of much importance, and derives its chief interest as the scene of Luther's early career. He was professor of philosophy and theology in the university, and there are still shown his cell, while a monk, in the Augustine convent, the Schlosskirche containing his tomb, and the house of Melancthon. Wittenberg has some manufactures of woollens, mats, and linens, and has some brewing and distilling. Population, 13,594.

**WIZARD** (that is, *wise-ard* or wise man), the masculine term now answering to the feminine witch, though this last was originally of both genders (Old English *wicca*, a wizard, *wicce*, a witch). See WITCHCRAFT.

**WOAD** (*Isatis tinctoria*) is a plant belonging to the order CRUCIFERÆ, which yields a blue colouring matter resembling indigo. It is occasionally found apparently wild in England, but is probably not a true native, as it was cultivated for dyeing purposes from an early period. Its original home is considered to have been South-eastern Europe, whence it spread through cultivation to the north and west of Europe, and into some parts of Asia. The Dyer's Woad is a biennial plant, growing to a height of 3 or 4 feet, with an upright branching stem, oblong or oval stalked radical leaves, narrower auriculate upper leaves and panicles of small yellow flowers. Before the introduction of indigo this plant was extensively cultivated both in this country and on the Continent for the blue colouring matter called woad. It was in use among the Romans for dyeing wool, and is supposed to be the dye alluded to by Cæsar as in use among the ancient Britons for staining their bodies. It has now been almost entirely superseded by indigo, except for mixing with that and other dye substances. It is prepared by grinding the leaves into a paste, which, after being collected into heaps and dried, is made into solid balls for sale. These balls are again reduced to powder and subjected to a process of fermentation before being used by the dyer. An allied species, *Isatis indigotica*, is a native of the north of China, where it is cultivated for similar purposes.

**WO'DEN.** See WOTAN.

**WOELFL, JOSEPH**, a musician, was born at Salzburg in 1772, and died in London in 1811 or 1812. He received his instruction from Michael Haydn and Leopold Mozart. His renown as a pianist became very great, and he appeared in London in 1799 with great success. His enormous hands allowed him to produce most extraordinary

effects of long skips and extensions, &c. He was exceedingly clever also at improvisation, always a very popular faculty. In 1801 he went to Paris, where he produced his successful opera "L'Amour Romanesque," but soon returned to London, which then became his permanent abode. About 1808, there being some factions opposition to Woelfl, he published his best known work, a sonata entitled "Ne Plus Ultra," as a defiance to other composers and pianists either to construct greater difficulties for the instrument, or to execute those contained in this work. In reply to the challenge, Dussek's sonata, recently published in Paris under the name of "Retour à Paris," was reprinted here with the title of "Plus Ultra," and these rival pieces have ever since each enhanced the interest of the other. Woelfl's death was induced by his habit of intemperance.

**WOLF** is the name of two or more species of carnivorous mammals belonging to the family CANIDÆ and to the same genus as the dog. In the article DOG, the question of the specific identity of the dog and the wolf has been discussed, and the probable opinion indicated that the domestic breeds of dogs are descended not from any one wild progenitor, but from the species of wolf, of jackal, and from other wild species of Canidæ now extinct.

The Common Wolf (*Canis lupus*) inhabits the northern parts of both hemispheres from the arctic regions to Southern Europe, Northern Africa and India. It is about the size of a large sheep-dog, standing about 32 inches high at the shoulder, and measuring about 40 inches in length, exclusive of the tail, which measures another 20 inches. It is of a dark yellowish-gray colour generally, but the colour varies exceedingly, being sometimes almost black, and in other varieties more or less white. The hair in the northern varieties is long and coarse, sometimes almost woolly; it is generally most developed on the neck, shoulders, and throat, and on the haunches; in warmer climates the hair is shorter. Of the European wolves the French are said to be generally browner and somewhat smaller than those of Germany; the Russian wolves are longer, appear more bulky from the great development of hair on the throat and neck, and have a very savage aspect; those found in the Scandinavian peninsula are similar to the Russian, but lighter in colour, and become white in winter; the wolves of the Alps are brownish-gray, and smaller than those found in France; those of Italy and South-eastern Europe are more or less tawny; a well-marked variety called the Black Wolf, found in the Pyrenees and in Spain, rarely in France, is very large and strong and of a very dark-brown colour. The tail of the wolf is bushy, but pendent, and not curling like that of the dog. The ears are very upright and pointed; the eyes are set very obliquely, giving a most sinister expression to the face.

Wolves are chiefly nocturnal in their habits, remaining concealed in their lairs by day and coming forth at night in search of prey. They are very swift of foot, and catch their prey by running it down. In the winter they usually unite on hunting expeditions in great packs. Their mode of attack differs from that of the cats, for they never lie in ambush, and the first blow is given with the teeth, not with the feet. Sheep, calves, deer, goats, dogs, birds, and even reptiles form their food. Horses are sometimes attacked, and even man when pressed by hunger. In winter, when food is scarce, wolves become very dangerous, for a pack never relinquish a chase on which they have entered, nor is their fierce pursuit checked though numbers fall beneath the shots of fire-arms. When hunting singly, however, the wolf seldom, if ever, attacks human beings or domestic animals, for it is actually a cowardly animal, and approaches its prey with great caution, rarely allowing itself to be trapped.

The wolf was formerly abundant in Britain when forests were more numerous. The Saxon King Edgar commuted the punishment of criminals on their delivering a certain

number of wolves' tongues, and is said to have laid upon a prince of North Wales a tribute of 800 wolves' heads annually. In subsequent reigns refuges were built in wild places for travellers, and lands were held in Derbyshire on condition of hunting and killing the wolves in the county. Even so late as 1577 the flocks of Scotland suffered from the ravages of these animals, and the last wolf in that portion of the kingdom is said to have been slain by Sir Ewen Cameron of Lochiel in 1680. In Ireland they appear to have lingered on as late as 1710.

Wolves are found in various parts of Asia, several of which are considered by some as distinct species. A variety, found over the whole of India, has dingy reddish-white hair, becoming dingy white on the lower parts; it is the *Canis pallipes* of some authors. Several distinct varieties are found in Tibet.

The American wolf extends from Greenland to Mexico, and is sometimes considered as a distinct species under the name *Canis occidentalis*. It is very similar to the common wolf, but is more stoutly built, with a larger head, shorter ears and legs, broader feet, longer and finer hair, and more bushy tail. Five varieties are known, differing like the varieties of the Old World wolf chiefly in the colour and character of the hair, on which account they are sometimes specifically distinguished. In their habits they agree with the common wolf.

The Coyote or Prairie Wolf (*Canis latrans*) differs sufficiently from the common wolf to entitle it to specific rank. It is about 3 feet in length, the tail measuring another 14 or 15 inches. The prevailing colour is yellowish-gray, sprinkled with black and white, with the under parts white. The muzzle is long and sharp, and the ears are large, triangular, and erect. The coyote is fleetier than the common wolf. It hunts in packs. It is found from Columbia to Mexico, and is abundant on the plains of the Missouri and Saskatchewan Rivers.

The Red Wolf (*Canis jubatus*) is another distinct species, inhabiting the marshy districts of Brazil and other parts of South America. It is a large animal, with long slender legs, a long muzzle, and long ears. It has a shaggy coat of stiff reddish hair, which is raised into a mane along the neck and shoulders. The red wolf is said to be solitary in its habits, and to feed on rats, small birds, reptiles, &c.

**WOLF**, a musical term applied to two very diverse phenomena, which have only this in common—that they are howling or discordant sounds.

The *wolf* so familiar and so formidable to players on stringed instruments, is a howling sound occurring at a certain pitch, unless the performer uses great care. The dreaded note, in almost all violins, is about *c'*, and in violoncellos about *f*; and it varies slightly in different instruments. Its cause is not quite known, but probably is connected with the proper resonance-tone of the cavity of the body. If very pronounced it renders an otherwise fine instrument almost unplayable.

The *wolf* of tuners is due to the accumulation of faults which an unskilful workman piles up, so that by the time he arrives at the last notes of his "bearings" the keys most affected are almost unplayable.

**WOLF-DOG** is a name given to those breeds of the DOG which resemble the wolf in their form—long woolly hair and more or less erect ears. The best known of this group is the SHEEP-DOG. Several breeds of wolf-dogs are also kept in a semi-domesticated state by savage tribes, which can with difficulty be distinguished by travellers from true wolves. A notable example of these is the ESKIMO DOG. The Newfoundland and St. Bernard breeds, though differing in their long pendulous ears, are often classed among the wolf-dogs.

**WOLF, FRIEDRICH AUGUST**, the great humanist and critic, was born at Haynrode, near Nord-



hausen, 15th February, 1759. Being instructed in the rudiments by his own father, a schoolmaster, he was sent to the gymnasium of Nordhausen, where he imbibed that love for independent and self-taught knowledge which characterized the whole course of his life. He was conversant both with the ancient and modern classics, when in 1777 he entered himself of the University of Göttingen as "studiosus philologie," an unheard-of innovation, which had nearly shut the gates of the *alma mater* in his face. Necessity drove Wolf to teach privately the Greek and English languages, and it was for the use of his pupils that he published in 1778 an edition of Shakespeare's "Macbeth," with notes. In 1783 he was called to the chair of philosophy and pedagogical science at Halle, which he filled for twenty-three years. At first his lectures were much above the capacities of his hearers, but when he had lowered his tone the students flocked to his class. The influence of his lectures, as well as of his writings, on the work of education in Germany, cannot be overrated. When in 1806 the university was closed, he repaired to Berlin, where he took a most active part in the establishment of the new university, and was preferred to high offices, which he, however, resigned one by one, and only continued his lectures. For the benefit of his broken health he was advised to go to the south of France in 1824, where he died (at Marseilles) on the 8th August of the same year. Wolf has altered the whole face of classical learning, not only in Germany, but all over the world. He was the first to develop in his lectures a complete system of philology. But he gained still greater fame by his "Prolegomena in Homerum," in which, by an admirable chain of arguments, he came to the result, that the *Iliad* and *Odyssey* are not the works of one single and individual Homer, but a comparatively late compilation of several lays and episodes sung by the *oidoi* and handed down by oral tradition. This startling theory set the world a-blaze, and several Hellenists, Heyne among the number, claimed for themselves the priority of the discovery. Wolf, therefore, in self-defence published his "Letters to Heyne" (Berlin, 1797), the first three of which are justly considered models of controversial writing and refined irony. The theory was wittily parodied as meaning "Homer's works were not written by him, but by some other man of the same name." It has now fallen into disrepute, having served the purpose of attracting the special attention of scholars to the inner structure of these immortal poems. Carlyle hits him off with one of his vivid strokes, as "a great-hearted irascible man."

**WOLFE, CHARLES**, an Irish clergyman and poet, the youngest son of Thomas Wolfe of Blackhall, Kildare, was born at Dublin in 1791, and educated in England. He returned to Ireland, entered Trinity College, and having taken orders, he was in 1817 appointed to the curacy of Ballyclog in the north of Ireland, and afterwards to that of Donoughmore in the diocese of Armagh. But his constitution was consumptive, and he died in 1823. He is chiefly known by his famous ode, "The Burial of Sir John Moore," which he composed in 1817, and which, according to Captain Medwin, Byron pronounced "the most perfect ode in the language."

**WOLFE, GENERAL JAMES**, an illustrious English commander, was born at Westerham, in Kent, on 2nd January, 1727, N.S. His father was a colonel when James was born, and afterwards rose to the rank of major-general. A commission was obtained for Wolfe at an early age, and he was present at the battles of Dettingen, Fontenoy, Falkirk, and Culloden, being wounded at Laufeldt in 1746. During the seven years of peace which succeeded 1748 he gradually rose to the rank of lieutenant-colonel.

Hostilities recommenced between France and Great Britain in 1756, and in 1758 Wolfe was despatched, with the rank of brigadier-general, on the expedition against

Cape Breton. The brunt of the French fire in landing before Louisbourg was borne by the left division under Wolfe. Louisbourg surrendered on the 26th of July, and soon afterwards Wolfe returned to England.

In 1759 an expedition was fitted out against Quebec, the command of the sea forces being intrusted to Admiral Saunders; that of the land forces (7000 men, including provincials) to Wolfe, who had been promoted to the rank of major-general. Montcalm, the French governor, had concentrated all the forces he could raise in the province of Quebec, and had fortified its capital in a masterly manner. Wolfe, on the night between the 12th and 13th of September, landed his troops immediately above Quebec, and, favoured by the night, ascended the heights of Abraham, which command the city. Montcalm, when he learned that the English were in possession of these heights, saw at once that nothing but a battle could save the town, and took his measures accordingly. The fight was strenuously contested, and both generals fell in the action, but the French at length gave way. Five days afterwards Quebec surrendered, and Canada was lost to France.

James Wolfe was killed in his thirty-fourth year. His remains were brought to England, and interred at Greenwich. A monument was erected to him in Westminster Abbey, which was voted by the House of Commons in 1759. His life has been published, with selections from his correspondence, and much new and valuable matter, by Robert Wright (London, 1864). The most interesting and valuable account of Wolfe is, however, in the "Montcalm and Wolfe" of Francis Parkman (London, 1885), the crowning division of a great series on the encounters of France and England in America, which was the enthusiastic labour of a lifetime.

**WOLF, JOHANN CHRISTIAN VON**, the leading mental philosopher of his time, though now become almost unreadable, was born at Breslau in 1679. He studied at Jena and Leipzig, and attracted the attention of Leibnitz, then in his full glory, by some early works. In 1707, on the recommendation of Leibnitz, he became professor of mathematics and philosophy at Halle. His "Aërometra" (1709) made him an F.R.S. of London. In 1712 he left natural science and mathematical treatises for philosophy, publishing his "Logie" in that year, and following it with several philosophical treatises. In 1719 his "Metaphysics" appeared, and his "Moral Philosophy" and "Political Philosophy" quickly followed. But the free tone of these works had roused suspicion, and his "Moral Philosophy of Confucius" brought angry accusations of atheism against him, the storm culminating in his expulsion and banishment from Prussia by Frederick William I., November, 1728. Wolf became professor at Marburg, and here, in 1728, his once celebrated "Rational Philosophy," in 1730 his "Rational Ontology," and in 1731 his "Rational Cosmology" appeared. In 1736 he published his "Natural Theology" in opposition at once to Spinozism and atheism. Meanwhile the king sought to win him back, ashamed of his conduct. But Wolf refused to return during Frederick William's life. In 1740 he resumed his post at Halle, and honours were heaped upon him by the youthful Frederick the Great, an ardent admirer of his, who had always resented Wolf's harsh treatment by his father. He was made Chancellor of the University and baron of the empire. His "Natural Law" (eight vols. 1740-48), "Moral Philosophy" (four vols.), and "Law of Nations" were written after his return. He died in 1754.

**WOLFENBUTTEL**, a town of North Germany, in the duchy and 8 miles S.E. of Brunswick, on the Ocker River, and the Brunswick and Magdeburg Railway. It is well built, and has a citadel, arsenal, and college with a library of 300,000 volumes, and many relics of Luther. The manufactures are ribbons, linen, lacquered and japanned wares, leather, &c. Population, 12,131.

**WOLF-FISH.** See ANARRHICUS.

**WOLF-TRAM** is a tungstate of iron often found in association with tin ores. It is a heavy blackish mineral, with a metallic or resinous lustre, and forms the chief source of the tungsten compounds used in commerce. Its admixture with the tin ores often renders the purification of the latter a process of considerable difficulty, the specific gravity of the two minerals being almost the same. This difficulty is often experienced in Cornwall, and is sometimes surmounted by fusing the mixed ores with soda ash, thus producing tungstate of soda, which can be removed by treatment with water. The soluble salt is of value as a mordant in dyeing, and is also employed for several other purposes. See TUNGSTEN.

**WOLF'S BANE.** See ACONITE.

**WOLF-SPIDER** (Lycosidæ) is a family of SPIDERS (Araneidea). The Lycosidæ are wandering predaceous spiders, and are so called from their habit of catching their prey by running it down like a wolf. They are chiefly nocturnal in their habits, lurking beneath stones, &c., in woods and commons in the daytime, and wandering about in pursuit of insects at night. Some of them are found on the margins of rivers and ponds, and hunt their prey on the surface of the water. They construct no snares. The eggs are generally carried about by the female in a kind of cocoon or bag attached to the under side of the abdomen. Some of the tropical species attain a large size. The British species are rather numerous, and some of them are common. The *TARANTULA* of Southern Europe (*Lycosa tarantula*) belongs to this family.

**WOLF-STONECRAFT, MARY.** See GODWIN, WILLIAM.

**WOLSEY, THOMAS**, an English prelate and statesman, was born at Ipswich in Suffolk, in 1471. His parents were reputable persons, and possessed of sufficient means to provide a good education for their son. He was sent to Magdalen College, Oxford, where he graduated at the age of fifteen. He was made fellow of his college, appointed teacher of a school in connection with it, and was ordained. At this school were three sons of the Marquis of Dorset, with whom Wolsey became acquainted, and through whose patronage he obtained his first ecclesiastical preferment, the living of Lymington, in Somersetshire. He was now twenty-nine years of age, and possessed a winning address, great natural ability, and many acquirements. Sir John Nafant, treasurer of Calais, whose acquaintance he made in Somersetshire, named him as his deputy, and by his influence at court procured for Wolsey a nomination as king's chaplain, and introduced him to Henry VII., in whose favour he soon gained a prominent place. He was sent on an embassy to Flanders relating to the marriage of the king, in which he gave the king great satisfaction; and it procured for him the deanery of Lincoln in 1508. In the following year the king died, and was succeeded by his son Henry VIII. Upon the young king's accession Fox, bishop of Winchester, who held the offices of privy seal and secretary of state, made Wolsey the king's almoner. Before the year of the king's accession had passed he had been appointed lord-almoner. In 1510 he became rector of Torrington, in 1511 canon of Windsor and registrar of the order of the Garter, in 1512 prebendary of York, in 1513 dean of York and bishop of Tournay in France, in 1514 bishop of Lincoln, and in the same year archbishop of York. In 1515 he was made a cardinal, and succeeded Warham as chancellor. In 1516, at the request of the king, Pope Leo X. made him *legatus a latere*. Besides the regular emoluments of his offices he farmed the revenues of the sees of Hereford and Worcester, held in *commendam* the Abbey of St. Albans and the bishopric of Bath, and drew besides large revenues from continental benefices. He had the tact to govern the state without letting Henry know it; and while the king

took a personal share in all important state affairs, it was Wolsey who directed them. He was constantly informed of the secret proceedings of the continental courts, and so skilfully preserved the balance of power between France and Austria that he was feared and courted by popes and princes, while the king held the position of arbiter of Europe. After the death of the Emperor Maximilian (1519), Henry VIII., Francis I., and Charles of Spain, Maximilian's grandson, became candidates for the imperial throne, and both Henry and Francis held out to Wolsey the prospect of the tiara in the event of their success. He was disappointed by the election of Charles, and though after the death of Leo X., and again on that of Adrian, he aspired to be pope, the French cardinals prevented his election.

Nobody could vie with this able prelate in display; his household comprised from 500 to 800 persons, among whom were barons and knights, and the sons of many distinguished families, while his retinue on the Field of the Cloth of Gold, at the interview between Henry VIII. and Francis I. of France, was more numerous and splendid than that of any other subject. At York Place (now Whitehall) his residence was furnished with every luxury; and he built for himself at Hampton Court a palace, of which he was obliged eventually to make a present to the king.

To circumstances connected with Henry's divorce from Queen Catharine the great minister's fall is mainly attributable. An oppressive and illegal taxation had made him unpopular with the multitude, while at court there were powerful enemies, especially the queen, Anne Boleyn, labouring to turn the royal mind against the favourite. In 1529 two informations were filed against him in the Court of King's Bench, charging him with having received bulls from the Pope without a formal license. Wolsey admitted the charge, and the court pronounced sentence that he was out of the protection of the law, that his lands, goods, and chattels were forfeited, and that his person was at the mercy of the king. He was ordered to retire to Esher, a country house belonging to the see of Winchester, and was so closely shorn of all magnificence as nearly to be wanting in the ordinary comforts of life. Many of his friends deserted him, but his humbler followers showed most faithful attachment to their master in his distress. Henry temporarily reinstated him in 1530. He was restored to the see of Winchester and the Abbey of St. Albans, with a grant of £6000, and of all other rents not parcel of the archbishopric of York. Even that archdiocese was afterwards restored. He arrived at Cawood Castle about the end of September, 1530, where he employed himself in magnificent preparations for his installation on the archiepiscopal throne. His enemies at court, however, were bent upon his ruin, and the Earl of Northumberland received orders to arrest him for treason, and to bring him to London. He proceeded towards the metropolis on his mule, but by the way he was attacked with a dysentery. As he entered the gate of the monastery at Leicester, he said, "Father Abbot, I am come to lay my bones among you;" and so the event proved. He died three days afterwards, 28th November, 1530.

In the management of state affairs Wolsey possessed great ability, and he was a magnificent patron of letters. He heaped preferment on native scholars, invited the most eminent foreigners to teach in the English universities, established at Oxford seven lectureships, and founded Christ Church College at the same university, besides a college at Ipswich, intended as a nursery for it. On the other hand he helped to establish an overmastering despotism, he was unscrupulous in his dealings with his enemies, and he was a bitter religious persecutor. It is very remarkable to notice how speedily Henry VIII. degenerated as soon as he was deprived of the assistance of his faithful and able servant.

His life was written by Cavendish, his gentleman usher (London, 1641). See also "Lives of the English Cardinals," by Folkestone Williams (two vols., London, 1868); "Letters and Papers of Henry VIII." (Rolls Series, vol. iv, part 1, 1870; part 2, 1872; introduction and appendix, 1875). A lucid exposition of his career and of the share he took in the great questions of his time, will also be found in Mr. J. A. Froude's "History of England" (reign of Henry VIII.); and in "The Earlier Years of Henry VIII." by J. S. Brewer, largely compiled from the original documents which Mr. Brewer, as custodian of the state papers under the Master of the Rolls, was the first to bring into order and to utilize (London, 1884).

**WOL'SUNG.** See VOLSUNG.

**WOLUS'PA.** See WALA.

**WOLVERENE.** See GLUTTON.

**WOLVERHAMPTON**, a parliamentary and municipal borough in the south of Staffordshire, 16 miles south of Stafford, 123 from London by road, 126 by North-western Railway, and 141 by the Great Western, *via* Oxford and Birmingham, from which latter it is only about 12 miles distant.

The town is situated on a slope near the Birmingham and Essington Canal, in a tract which abounds with coal, iron, clay, and grit stone, to which circumstance it is chiefly indebted for its prosperity and importance. The houses are of brick, and the streets in general irregular, but well-paved, and altogether Wolverhampton may be said to be well built. Indeed, notwithstanding its smoke-begrimed aspect, it may still be described as it was two centuries ago, "a handsome town, having a fair church." The suburbs are pleasant, and it has the additional advantage of being contiguous to several fine seats. The chief buildings are—St. Peter's Collegiate Church, which in 1859-65 was enlarged, rebuilt, and elaborately restored; numerous other churches and places of worship, one of which is a Gothic Independent Chapel, and another a Roman Catholic chapel and house of mercy, by Pugin; town hall, opened in 1871; market-house, exchange, and public baths; music-hall, theatre, atheneum, library, and news-room; Jenyn's Free Grammar-school, founded in 1513, with an annual income of £1200 per annum, in which Sir W. Congreve and Abernethy were educated, and for which a handsome building was erected in 1875; blue-coat and other schools; a very elegant school of practical art, for which a new building was erected in 1886; South Staffordshire Hospital, dispensary, and Lee's Orphan Asylum, founded in 1853, which has room for 200 inmates; a school of art, mechanics' institute, theatre, concert hall for 2000 persons, and handsome corporation offices and police barracks. In Queen Square is a striking bronze statue of the Prince Consort, which was inaugurated by her Majesty in 1866. There is an agricultural hall for the convenience of farmers, and a large and well-attended cattle market. The town is well supplied with water from Tettenhall and Cosford, and recently a thorough system of drainage has been carried into effect. In 1881, a fine park of 50 acres was opened, and a handsome cemetery has been laid out in the suburbs.

Wolverhampton is the capital of the "Black Country," and the great seat of the hardware trade in England. The enormous development of the manufacturing resources of the locality is rapidly bringing it into a degree of commercial importance, second only to that of its busy neighbour, Birmingham. Locks and keys, japanned ware, gas and water fittings, chains and anchors, nails and screws, with all the attendant branches, may be named among the more important articles of manufacture. One of the largest japan-ware factories was once the old hall of the Leveson-Gowers, who formerly resided in this town. The manufacture of tin-plate ware, japanned ware, and other goods of a similar kind, is carried on in numerous separate

factories, of which the greater number are situated at Wolverhampton and the rest at Bilston, about 2 miles distant. The articles made are trays, waiters, coal vases, baths, water cans, tea caddies, and a variety of tin toys. They are in demand not only for the home market, but for the colonies and India, South America, France, and Spain, Russia, and the United States. This manufacture arose about the middle of the last century. The lock-making trade, which was introduced about fifty years before, is next in importance. The export trade in locks is chiefly to Australia and other colonies, India, and South America. The trade with the United States is on the decline, as large numbers are now made in that country. The iron-work of fine plate locks is generally made by artisans working at their own homes in the rural localities of Brewood, Coven, Pendeford, and other villages between Wolverhampton and Stafford; but they are put together at Wolverhampton. The manufacture of cast-iron hollow ware is shared by Wolverhampton with Birmingham. There are also some extensive chemical manufactures, besides those of varnishes used in japanning, and the largest artificial-manure works in England are near the town. The hardware manufacturers in Wolverhampton, and most of the surrounding towns, are small factors, or masters employing only two or three hands, who make goods to sell to the merchants who come round. In the country parts the practice of farming is combined with that of labour at the forge. Generally speaking, all the goods made are remarkable for their beauty of finish and genuineness of workmanship.

In addition to its admirable situation with regard to coal and iron, Wolverhampton is partly indebted for the wonderful development of its trade to the excellence of its means of communication. Two of the oldest and most important canals pass through it, and it is also the focus of several large lines of railway, by means of which goods may be speedily transmitted to any port in the kingdom.

Wolverhampton was created a parliamentary borough by the Reform Act of 1832, and a municipal one in 1847. The latter is divided into eight wards, and governed by a mayor, twelve aldermen, and thirty-six councillors. In 1881 the population within the former was 164,332; within the municipal limits, 75,766. Three members are returned to the House of Commons.

The town was originally called Hamptun, and received its present name from Wulfrana (hence Wulfrana-hampton), sister of King Egbert, who, in 996, established a monastery here, which Queen Mary remodelled into a collegiate chapter.

**WOLVERTON**, a village of England, in the county of Bucks, 12 miles south-east of Northampton, and 52 north-west of London by rail. The town owes its origin to the great railway works of the London and North-western Railway Company, and has a population of 3611. There is a church, and science and art institute.

**WOM'BAT** (*Phascolomys*) is a genus of marsupial mammals constituting the family Phascolomyidae. There is only one species, *Phascolomys wombat*, a native of South Australia, New South Wales, Tasmania, and the islands of Bass Strait. The wombat is a short thickset animal, from 2 to 3 feet in length. The body is covered with long coarse grayish-brown hair, and ends in a mere stump of a tail. The limbs are stout and the feet are small and black, with broad naked soles. The fore feet have five toes, each provided with large strong slightly curved claws; the hind feet have four toes with long curved claws and a rudimentary clawless hallux or innermost toe. The head is large and broad, with a blunt black muzzle, small eyes, and short ears marked with white. In its dentition the wombat presents some resemblance to the rodents. The incisor teeth are two in number in each

jaw, long and chisel-like; they have no roots and grow continuously as they wear away. There are no canine teeth, and a wide gap intervenes between the incisors and the molar teeth. The marsupium or pouch is slit-like, and the marsupial bones are long, flat, and curved. The wombat inhabits mountainous districts, and lives in burrows in the ground, which it digs itself. It is nocturnal in its habits, quitting its retreat at night in search of food. It feeds on grasses and on roots, which it digs up with its claws. Its movements are slow, and it has a shuffling gait like that of a bear. In disposition it is mild and gentle, with some intelligence, and is easily domesticated. The female produces three or four young at a birth. The flesh is delicate and much esteemed.

**WONDERS OF THE WORLD, SEVEN.** See SEVEN.

**WOOD, ANTHONY**, a distinguished antiquarian, and celebrated as the historiographer of the university and colleges of Oxford, was born at Oxford on the 17th December, 1632. He was educated at New College School and at Merton College. He took his bachelor's degree in 1652. Wood devoted himself to the study of the antiquities of the colleges and churches of Oxford, collecting materials for his "History," which was published in London, 1674, in two volumes, under the title, "Historia et Antiquitates Universitatis Oxoniensis." This book was written by the author in English, but his labours were so highly esteemed that Dr. Fell, dean of Christchurch, employed Peers, one of the students of his college, to translate it into Latin. This perverse translator and editor so altered and disfigured the book, that its author would hardly avow it. It has since been corrected and printed in English, from the author's MS., under the care of the Rev. John Gutch. Wood soon afterwards engaged in another work on a kindred subject, which appeared in London in 1691-92, in two volumes; entitled "Athenæ Oxonienses: an exact history of all the writers and bishops who have had their education in the most ancient and famous University of Oxford, from 1500 to 1690." To this was added the "Fasti, or Annals of the University," for the same period. On account of his free criticisms of the Earl of Clarendon, to whom he (not doubtfully) imputed corruption, Wood was cited before the vice-chancellor. His book was burnt, and he was expelled for a time from the university. Anthony Wood died at Oxford, to which he had devoted his life, on the 29th of November, 1695, preserving to the last the recluse and eccentric habits by which he had been distinguished. He bequeathed his books and papers to the university, and these, according to his will, were deposited in the Ashmolean Museum. Though a diligent antiquary, he is noted for the strong prejudices of a narrow mind.

**WOOD ENGRAVING.** See ENGRAVING.

**WOOD, MRS. HENRY**, an English novelist, was born in Worcestershire in 1820. Her first novel, "East Lynne," had an enormous success, reaching a fifth edition within a year, and, indeed, at a congress of librarians in 1880, it was agreed to be more largely in demand than any other work of fiction. Other popular works of hers are "The Channings" (1862), "Mrs. Halliburton's Troubles" (1862), "St. Martin's Eve" (1866), "A Life's Secret" (1867), "Roland Yorke," a sequel to "The Channings" (1869), "Dean Hollow" (1871), "Johnnie Ludlow" (1874-80), stories reprinted from the *Argosy*, a periodical of which she was for many years editor; "Edina" (1876), "Pomeroy Abbey" (1878), "Count Netherleigh" (1881), and a very large number of other works of fiction. She died in 1887.

**WOOD OIL** or **GURJUN BALSAM**, a substance resembling Copaiba balsam, imported from Calcutta for medicinal use. It is obtained from various species of *Dipterocarpus* (natural order Dipteraceæ). It is a viscid balsam, having the specific gravity 0.964. It contains a

solid resin and a volatile oil, having the formula  $C_{20}H_{32}$ , the specific gravity 0.014, and boiling at  $255^{\circ} \text{C.}$  ( $491^{\circ} \text{Fahr.}$ ) The resin is gurgjunic acid ( $C_{22}H_{34}O_2$ ). It melts at  $220^{\circ} \text{C.}$  ( $428^{\circ} \text{Fahr.}$ ) and boils at  $260^{\circ} \text{C.}$  ( $500^{\circ} \text{Fahr.}$ ) It is dibasic, and forms salts with the alkalies; the potassium salt has the formula  $C_{22}H_{32}K_2O_4$ .

Gurjun balsam is used in India as a varnish and as a remedy for leprosy, and in this country in skin diseases, externally as a liniment and internally in doses of half a drachm to two drachms.

**WOOD OPAL** is a petrification of wood by the hydrated form of silica known as ORAL. A fine tree-trunk from Tasmania, partially converted into this mineral, is exhibited in the natural history branch of the British Museum at South Kensington.

**WOOD SPIRIT** or **WOOD NAPHTHA** is methylalcohol obtained from wood by destructive distillation. See METHYL-ALCOHOL.

**WOOD TIN**, a variety of CASSITERITE or tin-stone, occurring in nodular masses, showing a radiating fibrous structure and concentric markings.

**WOOD VINEGAR** is acetic acid obtained from wood by destructive distillation. See ACETIC ACID.

**WOOD WIND**, the technical term for the flutes, oboes, clarionets, and bassoons in an orchestra [see INSTRUMENTATION], and also the articles on the separate instruments.

**WOOD/BINE.** See HONEYSUCKLE.

**WOOD BRIDGE**, a market-town of England, in the county of Suffolk, 7 miles E.N.E. from Ipswich, of which it is a sub-port, and 78 miles from London, is situated on the north-west bank of the river Deben, where it forms an estuary 400 yards wide at high water, and receives the local designation of Woodbridge Haven. Vessels of small tonnage can come up to the town. It consists of two principal and several smaller streets, and as most of the good houses are surrounded by well-kept gardens its aspect is most pleasant. The market-place is very commodious; in the centre stands an ancient shire or sessions hall, where are held the quarter sessions for the eastern division of the county; the lower storey is appropriated as a corn market. The church, built of black flint, is large and handsome, with a square tower of flint and stone, 130 feet in height. There are also a custom-house, another church, barracks, grammar-school, public library, and fountain, the three latter being due to the Sackford almshouse fund, which also supports, out of its rich endowments, some splendid almshouses. The revenues of the fund and those of the grammar-school were united in 1861, some handsome new buildings erected, and a scheme provided for the school, under which its usefulness has been much increased. Woodbridge is a busy and prosperous town. The population in 1881 was 4544. The chief industries are brick-making, rope-making, malting, and shipbuilding. The port of Woodbridge is much frequented by small coasting vessels; corn, malt, and flour are exported; coal, timber, and general merchandise imported. On the low marshy river bank two good quays have been constructed, and there are some docks for shipbuilding.

**WOOD/CHAT.** See SHRIKE.

**WOOD/CHUCK.** See MARMO.

**WOOD/COCK** (*Scolopax rusticola*), is a game-bird belonging to the family SCOLOPACIDÆ and nearly allied to the SNIPES (Gallinago), from which it is distinguished by its more bulky form and shorter stronger legs, which are feathered to the knee. The woodcock has a very wide geographical distribution, being found at some season of the year throughout Europe, extending to Northern India and Japan, Northern Africa and Madeira. It is chiefly known as a winter visitor to Britain, though it breeds to some extent in England and (more frequently) in Scotland. For the most part, however, these birds arrive in this country from the forests of Northern Europe early in October, and

depart in March. During their residence here they frequent plantations and copses in the vicinity of water, remaining concealed during the day, and feeding at night on earthworms, slugs, snails, and insects. The woodcock is about  $14\frac{1}{2}$  inches in length, with the plumage varied with reddish-brown, yellowish, and ash colour above, marked with large black spots; the lower parts are yellowish-red, marked with brown zigzag lines; the quill-feathers of the wings are striped with red and black on their outer margins. Varieties occur with the plumage yellowish-red or yellowish-white marked with pale spots. Sometimes the wings and tail are white, and more rarely the whole of the plumage acquires that colour; another variety is well-known to sportsmen as a smaller bird with a darker plumage, the upper parts being largely spotted with black, and



Woodcock (*Scolopax rusticola*).

the under parts clouded with ash colour. The nest is placed on the ground in a dry warm spot among herbage, and is loosely constructed of dead leaves, chiefly of the common fern. The eggs, usually four in number, are pale yellowish-white, blotched, and spotted at the larger end with ash-gray, and two shades of reddish-yellow brown. When surprised, the female has been known to carry off its young tightly grasped between its thighs. The woodcock is highly esteemed, both for the table and for sporting purposes. On migration large flocks appear in some parts of our islands, especially on the west coast of Ireland. In England this bird is tolerably plentiful in Norfolk, Hampshire, and Devonshire; and is also abundant in some parts of Scotland, especially in the islands of the north-west coasts. The cocker and springer, small breeds of spaniels, are used in woodcock shooting.

#### WOOD-GROUSE. See CAPERCAILLIE.

**WOOD-IBIS** (*Tantalus*) is a genus of wading birds belonging to the STORK family (Ciconiidae). The bill resembles that of a stork, being long, strong, and nearly cylindrical; but the tip is slightly curved downwards, and the upper mandible is slightly notched on each side at the tip. In the character of the nostrils and feet the wood-ibis resembles the stork, and differs from the true ibis, which belongs to the family Plataleidae (Spoonbills). The African Wood-ibis (*Tantalus ibis*) was long regarded as the sacred ibis of the Egyptians. It is, however, rare in Egypt, and is found chiefly in western tropical Africa. The plumage is white, slightly clouded with purple on the wings; the skin of the face is naked and of a red colour. The American Wood-ibis (*Tantalus loculator*) is about the size of the common stork, with the plumage white, the quill feathers of the wings and tail dark metallic blue, and the skin of the face and a portion of the neck naked and greenish-blue. It is abundant in the Southern United States, breeding in immense numbers in the tops of trees in cypress swamps.

#### WOOD LOUSE. See ISOPODA.

**WOODPECKER** (Picidae) is a family of birds belonging to the order PICI. The woodpeckers are especially

formed for climbing up the bark of trees, and for obtaining from the crevices thereof the insects which constitute their food. The feet, though very short, are unusually strong; the claws are strong, sharp, and curved, and the toes placed in pairs, that is, two forward and two backward. As an additional and powerful support in their rapid and perpendicular ascent up the trunks of trees, their tail feathers terminate in points and are uncommonly hard, so that when they are pressed against the bark they assist the bird in its progress or in keeping its position. The bill, destined for the laborious operation of penetrating the wood or stripping off the bark of forest trees, is admirably adapted for the purpose, being wedge-shaped, furnished with regular-sided angles, and in one species, *Campophilus principalis*, nearly of the colour and consistence of ivory, whence it has been termed the *Ivory-billed Woodpecker*. The tongue is barbed at the point, capable of being protruded to a great length, and lubricated by a glutinous secretion. This mechanism enables the bird to introduce it into holes and crevices, and under the loose bark of trees, to the destruction of insects there harboured.

The woodpeckers are found in every part of the world except Australia, and are especially abundant in America. They are generally solitary in their habits, and inhabit woods and forests. Their powers of flight are limited, but they run with great activity on the trunks and branches of trees, where they may be heard tapping the bark with their bills to discover soft or rotten places which may harbour insects or their larvæ. They feed also to some extent on fruits and seeds, and some obtain their insect food largely on the ground. They roost and breed in the holes in the trees, which they enlarge by means of their strong sharp bills. The eggs are deposited on the chips and debris at the bottom of the hole; they are variable in number, but are almost always of a glossy white colour.

The Great Black Woodpecker (*Picus* or *Dryocopus martius*—fig. 1, Plate PICI) is a native of the pine-forests of Europe from the extreme north to Spain; but the evidence on which it has been regarded as a member of the British fauna is not authenticated. The length of this bird is about 16 inches, and its plumage is of a deep black colour, with the top of the head slightly crested and bright blood-red. Its note resembles a loud, hoarse laugh. Its food consists chiefly of insects, which it captures upon or under the bark of trees as already described; it will also feed on nuts, seeds, and berries. It lays three eggs of a pure white colour.

The Great Spotted Woodpecker (*Dendrocopos major*) is found in all parts of Europe, and is not uncommon in some parts of England, but is rare in Scotland. It is shy and reclusive in its habits, and rarely descends to the ground. Its food consists chiefly of insects, but it will also feed on nuts, acorns, seeds and berries, and plunders orchards of cherries, plums, and other fruits. The peculiar jarring noise, for which this species is especially distinguished, is made by the bird rapidly hammering with its beak on the surface of the wood, and appears to be a substitute for a call-note. The great spotted woodpecker is nearly  $9\frac{1}{2}$  inches in length, and is of a black colour above, with the forehead and the sides of the head dirty white, the back of the head bright scarlet, and a spot on each side of the neck, the scapulars and numerous spots on the wings white; the under parts are dingy white, except the vent and lower tail coverts, which are bright scarlet. The Lesser Spotted Woodpecker (*Dendrocopos minor*) is the least of the European woodpeckers, but by no means the smallest of the family. It is pretty generally distributed over Europe, from Scandinavia to Italy, and extends as far east as Siberia and Japan. It is not uncommon in England as far north as York, frequenting woods, and feeding almost entirely on insects.



It is about 5½ inches in length, and has the upper surface black, barred with white on the back, the crown of the head scarlet, the wings grayish-black with white bars, and the lower surface grayish-white streaked with black.

The Green Woodpecker (*Cecinus viridis*) is the most abundant of the British woodpeckers, and is found in most of the wooded districts in the southern and midland counties of England, but is rare north of Derbyshire, and has been only occasionally found in Scotland and Ireland. It also occurs in almost all parts of Europe. It is about 13 inches in length, and is of a dark yellowish-green colour above and ashy-green below; the crown and back of the head are scarlet; a black moustache-like streak, with a scarlet patch along its middle, runs backwards from the base of the lower mandible on each side; the rump and upper tail-coverts are sulphur-yellow; and the quill-feathers, both of the wings and tail, are grayish-black, more or less distinctly spotted or banded with white. Its flight is short, undulating, and rather laborious. It obtains its food both upon trees and on the ground. A very large proportion of it is derived from ants and their eggs.

The nest is generally formed in an elm or ash or poplar, a trunk or branch which is rotten at the heart being generally selected in which to excavate a hole. The eggs, from four to seven, are pure white, and are deposited on the bare loose decayed wood. Its note resembles a loud laugh. The popular English names for it are woodspite, yaffle, woodwall, and whetile.

The American species of woodpeckers are very numerous. The Red-headed Woodpecker (*Melanerpes erythrocephalus*), one of the commonest species, is an inhabitant of the United States and Canada, performing a southward migration from its most northern haunts at the approach of winter. Its length is between 9 and 10 inches; its head and neck are deep scarlet; the upper surface is black, with a bluish gloss; the lower parts, rump, and a broad band across the wings are white.

This bird, like the rest of its family, frequents woods and orchards, and feeds upon the insects which it dislodges from their retreats in or under the bark. It also feeds on fruits, especially on cherries, apples, and pears, so that a reward was formerly given by the state legislatures for its destruction; it also attacks the Indian corn when in the milky state. An allied species, the Californian Red-headed Woodpecker (*Melanerpes formicivorus*), is remarkable for storing up acorns, which are neatly packed in holes made in the bark of trees, and even in cracks in the wooden porticos of houses. The acorns usually contain each a single larva of an insect, and this singular habit appears to be a provision for their young.

The Piculets (*Picumnidæ*) are diminutive birds, natives of tropical regions, which differ from the true woodpeckers chiefly in the character of the tail, which is short, with the tips of the feathers rounded.

**WOODRUFF** (*Asperula odorata*) is a plant belonging to the order RUBIACEÆ, common in Britain in woods and copses, in shady places. The woodruff is well known for the fragrance of the leaves, which, when dried, give out a powerful odour of new-mown hay; this perfume is retained for years. It forms an agreeable herb-tea, and is used in Germany to impart a flavour to some of the Rhine wines. The woodruff has an erect stem about 6 inches high, lanceolate bright green leaves in whorls in a star-like form round the stem, and fragrant white flowers in terminal corymbs with a four-cleft funnel-shaped corolla. The Quinsy-wort (*Asperula cynanchica*), an allied species, occurs on dry banks in chalky districts in Britain. It is a small trailing plant, with small pinkish-white or lilac flowers. The leaves contain a bitter astringent principle, which is a popular cure for quinsy. There are several other species, natives of the northern parts of Europe and Asia, which are hardy and are cultivated for rockeries, &c.

**WOODS AND FORESTS.** A considerable portion of the royal revenue formerly consisted of the rents and profits of the crown lands, which comprised numerous lordships and honours, together with forests and chases; from the forests the principal source of profit lay in the fines or amerciaments levied for offences against the Forest Laws. The demesne lands which were retained by the king, or which came to the crown by forfeiture or otherwise, and were farmed out to subjects, were originally very extensive; but owing to the generosity or the necessities of different kings, so large a part of them was granted away, that the Houses of Parliament frequently interposed in order to prevent the total alienation of the crown property. William III. had used the power of alienation so profusely, that upon the accession of his successor it was enacted (1 Anne, s. 1, c. 7) that no grant or lease should be made of any crown lands for a longer term than thirty-one years, or three lives, but permitting houses, &c., to be let for fifty years.

By the 46 Geo. III. c. 142 (altered by the 58 Geo. III. c. 65), an office of surveyor-general of his Majesty's works and public buildings was created; but this and some other offices were incorporated with that of the Commissioners of her Majesty's Woods, Forests, Land Revenues, Works, and Buildings (2 Will. IV. c. 1, s. 1), who are commonly called the Commissioners of Woods and Forests, which office or board owed its shape to the statute 10 Geo. IV. c. 50 (amended and extended by 2 Will. IV. c. 1; 2 & 3 Will. IV. c. 112; and 3 & 4 Will. IV. c. 69). The union of the works and buildings with woods and forests having been considered inexpedient, the Act 14 & 15 Vict. c. 42 placed the public works under separate control. The Commissioners of Woods and Forests, who are not to exceed three in number, are appointed by letters patent. They act under the control of the Treasury, and the annual receipts and expenditure accounts of their department are audited by the controller and auditor-general. The annual income of woods and forests amounts to about £370,000.

The real property of the crown may be thus classified:—

1. Honours, manors, and hundreds not in lease.
2. Other lands in the occupation of the crown, either for the personal convenience of the sovereign or for the public service.
3. Forests, chases, and wastes.
4. Lands, tenements, and hereditaments held of the crown by lease.
5. Free-farm rents, issuing out of lands, tenements, and hereditaments held of the crown in fee-simple.

The second class comprises the royal palaces and houses, such as Windsor Castle, Buckingham and St. James' palaces, the palace of Greenwich, Somerset House, &c.; and the parks of St. James, Hyde, Battersea, Victoria, Bagshot, Bushey, Greenwich, Hampton Court, Kew Gardens, Richmond, and Windsor. This class is now under the supervision of the office of Works and Public Buildings.

In the third class are included not only the royal forests which have preserved their *jura regalia*, but several nominal forests and chases, warrens, wastes, &c. The following is a list of the real forests:—In Berks, Surrey, and Wilts. Windsor Forest; in Essex, Epping Forest; in Gloucestershire, the Forest of Dean; in Hampshire, Bese Forest, New Forest, and the Forest of Woolmer and Alice Holt.

**WOOD'S HALFPENCE**, famous as having called forth the immortal "Draper's Letters" of Swift (signed "M.B., draper," i.e. draper, as we now spell it), were a coinage by privilege of George I., granted to William Wood, an ironmaster of Wolverhampton, in 1724. A copper coin was so scarce in Ireland that workmen were being paid with tin tokens and the like. Wood bought the right to send £20,000 worth of halfpence and farthings to Ireland in fourteen years, the standard of copper being agreed upon. Swift, without troubling to examine the case, saw an

opportunity for bringing the Irish people together in a common action. To raise the Irish was the dream of his life, and he saw no other way to attain it than by familiarising them with united action on public subjects, no matter what. Therefore he denounced, in the character of a patriotic tradesman, a Dublin draper, these Wood's halfpence, which he said were to be exchanged for the good money of Ireland, being themselves almost worthless. In vain did Sir Isaac Newton, as master of the mint, testify that Wood was giving more copper in his coin than had ever been sent to Ireland before, the storm grew, and the halfpence were everywhere refused. The government offered £300 for the name of the writer, and arrested the printer. The jury received a letter from the supposed "Draper," called "Seasonable Advice to the Grand Jury," which so moved them that they threw out the bill. Eventually the patent was revoked: the dean had triumphed.

**WOODSTOCK**, a market-town of England, in the county of Oxford, 8 miles north-west of Oxford, and 69 miles from London by the Great Western Railway, is situated on a rising ground on the east bank of the Glyme, a stream which is expanded into a lake in Blenheim Park. The hamlet of Old Woodstock may be considered as forming part of the town, which contains some good streets and houses. The town-hall, a handsome stone building, was erected in 1766, at the expense of the Duke of Marlborough, after a design by Sir W. Chambers. The greater part of the church was rebuilt in 1785, on the site of a chantry founded by King John, some remains of which still exist. The only manufacture is that of gloves, which has declined of late years. The population in 1881 was 1133. Blenheim Park, which contains the magnificent mansion of the Duke of Marlborough, is in the neighbourhood of Woodstock. It was presented by the nation to the hero of Blenheim, and the palace was built from the designs of Vandergucht—a heavy, yet superb and stately pile. The gardens are finely laid out. The park, which is beautifully diversified and well wooded, covers 2700 acres, and extends 12 miles in circuit. On a hill near the lake rises a column, 134 feet, to the memory of the great duke. In 1885 Woodstock was deprived of its representative in the House of Commons under the Redistribution of Seats Act.

Woodstock was an ancient residence of our English sovereigns. Here Alfred the Great translated Boethius: Henry I. established a menagerie; and Henry II. wooed the fair Rosamond. Henry III. narrowly escaped assassination here; and Edmund of Woodstock, son of Edward I., and Thomas, son of Edward III., as well as Edward the Black Prince, were born in the ancient palace, which was afterwards the prison of Princess Elizabeth in 1555, and the scene of the "ghostly tricks" played upon the parliamentary commissioners in 1649. Sir Walter Scott has made the latter events prominent in his novel of "Woodstock." The site of the royal mansion is marked by a couple of sycamores in Blenheim Park.

**WOODVILLE, ANTONY**, second Earl Rivers, one of the great friends and supporters of Caxton, was the brother of Elizabeth Woodville, the queen of Edward IV. He is memorable to us as the translator from the French of a book of "Les Dictes moraux des Philosophes," as "Dictes and Sayings of Philosophers," which is the first book known with certainty to have been printed in England. The "Game and Playe of the Chesse" was printed by Caxton in 1474, but without place-name; and it is quite possible it may have been done at Cologne. The "Dictes and Sayings" is dated 1477, and bears the note "imprinted by me, William Caxton, at Westmynstre." The earl had consulted Caxton as to the translation, and they had corrected it together. A couple of religious tracts, printed by Caxton, are also due to Lord Rivers.

Woodville married the heiress of Lord Scales in 1467, and took that title; two years afterwards his father was

beheaded at Northampton, and he became Earl Rivers. He went with his brother-in-law, the king, to Holland, in 1470, and was governor of Calais in 1471. He was rightly held the most accomplished nobleman in England, and was named guardian of the youthful Edward V. in 1482. Upon the death of Edward IV. in 1483 Lord Rivers was seized by his brother-in-law, Richard III., at Stony Stratford, 30th April, 1483, while conveying Edward from Ludlow to London, under the protection of an armed force. The young king was taken to London by Richard, and Lord Rivers was beheaded at Pontefract, 26th June, on the first idle pretext that came to hand.

**WOOL** (Anglo-Saxon *wul*) is the term commercially applied to the hair of the goat, the sheep, the alpaca, and to similar substances made use of in weaving or felting. It differs from ordinary hair in being always more or less undulatory, and in the overlying scales which the microscope shows to cover every filament. It is owing to these scales and to its general waviness that it is capable of being woven, as the fibres thus become caught or embarrassed in each other, and the scales hook together, so that the filaments easily retain the twist given to them by the spinning wheel. The structure of the thread, and the texture of the cloth woven from it, depend on the comparative closeness and cohesion of the scales in the original substance. Thus arises the difference between *combing* and *carding wools*; the former are the least wavy, and, if we may use the expression, the less scaly; the latter being much waved and marked by numerous serratures are called *carding wools*, because they are prepared for spinning by passing through carding machines. The serratures, or points of the scales, are microscopically small, as many as 3000 being sometimes found, and seldom less than 1200, in a single inch.

The hair of the sheep has been treated as wool from the earliest antiquity. Woollen clothing is mentioned by Homer, and every reader will remember how Penelope occupied herself in spinning while waiting the return of her wandering Ulysses.

England early obtained a celebrity for her woollen products. Norfolk was the chief seat of the manufacture, whence it spread into the west of England, and especially into Somersetshire. The best wool then came from Derbyshire and Shropshire; the worst from Westmorland and the South Downs, where the pasturage was of a poorer quality. It has been well observed that the great excellence and abundance of the English wool in mediæval times was due, in all probability, to the comparative effectiveness of the police of this country, or, as it was styled, to the maintenance of the king's peace. Large flocks of sheep can only be reared in lands which are safe from the ravages of war, and where the farmer is not called upon to supply the requisitions of marauding troops or rapacious freebooters.

The woollen manufacture was recognized by statesmen as so important a staple of national wealth, that its encouragement was the guiding motive of the foreign policy of England and the Low Countries during the fourteenth and fifteenth centuries. The desire to obtain a free supply of English wool induced Jacques Van Artevelde to form an alliance with Edward III. The aggressive designs of the house of Burgundy, which then ruled over Flanders, were frequently checked by the necessity of avoiding any injury to the Flemish manufactures. The English government, on the other hand, in its anxiety to render the country independent of foreign supplies, used every means of promoting the home manufacture. For this purpose it interfered at times to limit or prohibit the export of wool, to fix its price, and to determine the places whereat it should be sold. The revenue was occasionally augmented by a tax on this never-failing article of supply, and we read of so many thousands of sacks, or a tithe of



fleeces, as a common parliamentary grant to the necessitous sovereign.

It is said that the merino wool, for which Spain was formerly so celebrated, originated in the export of English sheep in exchange for Spanish horses, and their consequent cross with a native breed. Some of the descendants of the merinoes were carried to Germany at the beginning of the present century, and this gave rise to the fine Saxony wools. Many restrictions on the exportation of English and on the importation of foreign wool were continued until 1825, when it was subjected to a simple *ad valorem* duty of 1*d.* if worth more than 1*s.* per lb., or  $\frac{1}{2}$ *d.* if worth less. This duty was abolished in 1840.

It should be noted that good wool is seldom found in connection with good mutton, and that the improvement in the breeds of sheep is detrimental to the quality of the fibre and the softness of the fleece. The best wool, moreover, is grown in a hot dry climate. For these reasons English wool has of late years been reckoned inferior to the merino, Saxony, and Australian wools, the last of which now commands the highest price in the market.

Shorn fleeces are divided into two classes:—First, *hogs* or *tegs*, these being the first yield of the sheep; second, *wethers* or *curs*, the yield of succeeding years. The first class, or yearling fleece, is generally longer in the staple than, and in several other respects superior to, that of the second. *Skin wool* or *pelt wool* is cut from the skins of slaughtered animals, and being obtained in all stages of growth, varies in quality much more than fleece wool.

The different breeds of sheep are divided into two general classes, viz. long and short woolled—the long-stapled wool being used for worsted, and the latter for woollen goods. Of the long-wooled sheep the best native breeds are the Leicester, Lincoln, and Cotswold; of the short-wooled, the Down, the Welsh, and the Shetland.

The Lincoln wool is very long and silky in appearance, but coarse in texture. It is much used for lustres, which are imitations of alpacas. The Leicester is finer, but not so soft, and much esteemed for combing purposes. Cotswold resembles Leicester, but is slightly coarser.

Of the Down breeds the finest is, perhaps, the Shropshire, on account of its silkiness and length in the staple. Next in value ranks the Norfolk. The South Down is short in staple and small-haired; it is chiefly employed in the manufacture of flannels. The Hampshire and Oxford are coarse and long. Both the Welsh and Shetland wools are of hairy texture and inferior quality, being only used for articles which do not require shrinking or felted. Dorset is a soft, clean, useful wool; the Cheviot, small and fine-haired. The quality of British wools has been injured by the desire of farmers to cultivate good mutton-producing breeds, and rear large flocks for the supply of the meat market.

Among wool-producing countries we have shown that Australia now occupies the first rank. The Australian wool is well adapted for the manufacture of soft, elastic, and pliable stuffs, owing to its silkiness and the fineness of its staple. The breed has sprung from three merino rams and five ewes imported into New South Wales by Captain McArthur in 1797, and the remarkable increase in the flocks is one of the most curious facts in the history of the colony. The number of sheep in the Australian Colonies (including Tasmania and New Zealand) in 1887 was nearly 90,000,000, and the total annual yield of wool is now over 400,000,000 lbs., valued at £20,000,000.

The introduction of merinoes into South Africa has greatly improved the quality of the wool supplied by the Cape Colony, and the demand for it has of late years considerably increased.

Much of the Indian wool is very inferior, but large quantities are still imported and manufactured into cheap low-class fabrics. The South American wool is of dif-

ferent kinds. That which is known as alpaca, being from 7 to 12 inches long, of various colours, and very fine, is deservedly held in high estimation.

The finest and most valuable of all wools is produced by the Tibetan goat, being found next the skin, under the animal's thick hairy coat. It supplies the material of the well-known Cashmere shawls, and in the native markets fetches the price of 6*s.* and 7*s.* per lb., owing partly to the tedious labour required in order to separate it fibre by fibre from the hair or "hemp" of the outer coat of the goat.

In Germany sheep are reared chiefly for the sake of their wool, and that of Saxony and Silesia is still unequalled in quality. In Austria the number of sheep is estimated at 30,000,000, and it is said that the fleece is often so exquisitely fine that twelve of its hairs will not exceed in thickness one hair obtained from a Leicester sheep.

The wool of Italy is from mixed merino breeds, and of excellent texture. Russia supplies various kinds, and France also holds a good place among wool-producing countries.

The amount of wool yearly grown in Great Britain is supposed to be 175,000,000 lbs., but the materials required for forming a correct estimate are rather meagre and unsatisfactory.

Up to 1791 no importations of foreign wool took place, the whole of the British cloths having previously been manufactured from native grown wool, the annual supply of which amounted to about 100,000,000 lbs. The first foreign growth came from Spain, and the quantity in 1803 had already reached 7,000,000 lbs. The fine Saxony wool then grew into favour, and took precedence of all others till 1841, when it was found that our own colonies could furnish us with a cheaper material. Australia entered into vigorous competition with its European rivals, and in twenty-five years its exports increased upwards of 100 per cent. Very little German wool is now used in Great Britain except for the finest broadcloths, ladies' shawls, and similar articles, while the supply from Spain has not only greatly decreased in quantity, but seriously degenerated in quality.

Our principal sources of supply are Australia, South Africa, South America, and the East Indies. The quantities received from these sources have varied of late years in a very remarkable manner, though the aggregate has steadily and rapidly increased; the most wonderful instance being that of Australia, from which country the imports increased from less than 2,000,000 lbs. in 1830 to 384,857,438 lbs. in 1887. In the previous year it had exceeded 400,000,000 lbs.! The imports from South Africa now amount to over 60,000,000 lbs. per annum, and from the British East Indies to over 30,000,000 lbs.

*Worsted* is spun wool, and derives its name from a town in Norfolk where its inventor resided, about 1310. *Shoddy* is made from the rags of worsted goods; *mungo* from those of woollen. Both are treated in the same way; the rags being put into a machine called a willy, where they are torn to pieces by a revolving cylinder covered with short hooks, and the material reduced to wool capable of being reworked. *Shoddy* is chiefly used in the manufacture of light cloths adapted for warm climates or indoor wear. The name has been originated by the Yorkshire spinners, and is derived from *shed*, a term formerly applied to the waste thrown off or *shed* in the process of spinning.

*Mohair* is the wool of the Angora goat, a native of Asia Minor, which produces a fine, long, silken, and pure white fleece, with an average length of staple of from 5 to 6 inches. Each animal, when clipped in April or May, yields from 2 to 4 lbs. of this wool, which is chiefly employed for ladies' dresses. The animal has been successfully introduced into the Cape of Good Hope and

California; but about five-sixths of the total quantity imported into the United Kingdom is brought from Turkey, while nearly all the remainder comes from the Cape of Good Hope.

The total quantity of wool imported into the United Kingdom in 1887 was 574,196,058 lbs., value £24,280,593.

The increase in the trade is strikingly shown in the accompanying table, in which it will be seen that the quantity imported was nearly quadrupled between 1860 and 1886. The table includes alpacas as well as sheep's wool, but the former only amounts to between 3,000,000 and 4,000,000 lbs. yearly:—

QUANTITIES OF WOOL (SHEEP, LAMB, AND ALPACA) IMPORTED INTO THE UNITED KINGDOM FROM VARIOUS COUNTRIES, AND TOTAL EXPORTED.

Years.	Germany.	Other Countries of Europe.	British Possessions in South Africa.	British India.	Australasia.	South America.	Other Countries.	Total Imported.	Total Exported (Foreign and Colonial only).
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1860	8,954,314	27,908,970	16,574,345	20,214,173	59,168,616	8,350,629	4,627,303	118,396,577	30,761,967
1865	7,138,340	27,414,233	29,220,623	17,108,617	109,734,261	17,867,853	3,610,209	212,306,747	82,444,930
1870	4,405,897	19,290,442	32,785,271	11,143,145	175,081,427	12,693,777	7,835,275	263,250,499	92,542,384
1875	7,320,760	28,591,569	41,112,213	22,819,289	238,631,824	11,954,327	10,993,165	365,065,578	172,075,439
1880	7,173,932	49,409,938	51,385,839	29,190,049	300,626,854	10,282,206	19,440,345	463,508,963	237,408,589
1886	3,287,788	65,348,143	61,257,406	34,596,693	401,425,430	16,976,066	13,579,469	590,470,995	312,004,380

Wool is remarkable for containing in the natural state a considerable quantity of the sweat of the sheep, which is a peculiar soap, known as suintate of potassium, a compound of a fatty acid called suintic acid and potash. It is separated from the wool by washing in water, and forms a considerable source of commercial carbonate of potash, especially in France. [See POTASSIUM.] The fatty acid contains a large percentage of cholesterol, and under the name of lanoline is much employed in medicine as an ointment. Wool is soluble in boiling solution of caustic soda, and woollen fabrics can be thus distinguished from cotton or linen, which are insoluble in the alkali. It is insoluble in cuprate of ammonia, which dissolves cotton and linen. It is also dyed yellow by picric acid, which does not colour the other fabrics. Silk presents the same reactions.

**WOOLLEN MANUFACTURES.** In the preceding article we have referred to the use of woollen garments among the nations of antiquity. Spinning and weaving were practised in Asia Minor from a very remote period, and Herodotus tells us that they were in vogue in Egypt, though in that country weaving was solely the employment of the male sex.

Throughout Europe, on the contrary, it was, in the earliest ages, the task of women only. The mother, assisted by her daughters, wove clothing for all her household. This domestic custom is the source in the works of the epic and tragic poets of many interesting *dénouements* and expressions of affection between "kith and kin." Thus Kreusa proves herself to be Ion's mother (Euripides, "Ion," 1416-17) by describing the pattern of a shawl which she had woven in her youth, and in which she had folded her infant son. Iphigeneia discovers her brother Orestes (Euripides, "Iphigeneia in Tauris," 814-17), and Elektra recognizes him on another occasion (Æschylus, "Chœphorai," 225) by the figured garments which he wore, and which they long before had woven for him.

Weaving, both among the Greeks and Romans, was a distinct trade, carried on by the members of a particular guild or craft (Gr. *uphantai*; Lat. *textores*, *textrices*, *luteones*), but every respectable private householder, especially in the country, was provided with a loom (Gr. *hístos*; Lat. *telas*), as well as with the entire apparatus needful in the working of wool. "These occupations," says Mr. Yates in Dr. Smith's "Dictionary of Antiquities," "were all supposed to be carried on under the protection of Minerva, specially denominated *Ergané*, who was always regarded in this character as the friend and patroness of industry, sobriety, and female decorum."

Among the Romans the upright loom was in use; it is now discarded everywhere in Europe, except in some parts of Iceland. The roller on which the web was wound was turned by a handle. The threads of the warp were

separated by a transverse rod or plank, and also divided into various parcels, to each of which was suspended a stone for the purpose of keeping the warp in a perpendicular position, and allowing the necessary play for the strokes of the spatha, which, however, at a later period was superseded by the comb (Lat. *pecten*; Gr. *kerkis*), whose teeth were inserted between the threads of the warp, and thus made by a forcible impulse to drive the threads of the wool close together.

Probably the wool manufacture was introduced into England by the Romans, but it did not become an important staple until the era of the Conquest, when some Flemish weavers settled here under the patronage of the queen. During the stormy reigns of the early Plantagenets the trade again died out, but was revived in 1331 by an importation of Dutch weavers, at the command of Edward III. Its chief seat was then the county of Norfolk, and especially the towns of Norwich, Aylesham, and Lynn. The principal mart for the disposal of English and foreign cloth was Stourbridge Fair, which was held in a field about 2 miles from Cambridge, lasted a whole month, and attracted crowds of sellers and buyers from all parts of England and of Western Europe.

In 1530 was invented a new spinning wheel, which gave the trade a fresh impulse, and the settlement in England of the French Protestant refugees driven from France by the revocation of the Edict of Nantes introduced numerous improvements in the cloth manufacture. The invention of the spinning-jenny, mule, power-loom, the application of steam as a motive agency, and other ingenious devices, have since carried it to an unprecedented degree of prosperity.

Wools are divided into two principal divisions, *carding* and *combing wools*, equivalent to *short wools* and *long wools*, and the fabrics woven from them are termed *woollens* or *worstedes*, according as the one or the other is employed. Carding wools possess in high perfection that peculiar property which enables the fibres to "felt" or interlace one among another, and thereby to form the firm compact material of which our cloth garments are chiefly made. But combing wools, despite the length of their staple, are deficient in this "felting" tendency, and consequently are most suitable for stuffs, merinos, hosiery, and articles of a similar description.

With respect to the processes of woollen manufacture, if a piece of superfine broadcloth, as requiring in succession all the operations upon the wool, yarn, and fabric needful for woollens of any sort, be taken as the representative of the whole class, the following are the processes through which the materials are passed:—(1) sorting the wool; (2) scouring; (3) washing; (4) drying; (5) dyeing (when dyed in the wool); (6) willing; (7) picking or

teasing; (8) moating; (9) oiling; (10) scribbling; (11) plucking; (12) carding; (13) slubbing; (14) spinning; (15) reeling; (16) warping; (17) beaming; (18) singeing, sizing, and other preparation of the threads for—(19) weaving; (20) scouring; (21) dyeing (when dyed in the piece); (22) drying or tentering; (23) burling; (24) milling or fulling; (25) scouring; (26) drying or tentering again; (27) raising, dressing, or teazelling; (28) shearing; (29) boiling; (30) brushing; (31) picking; (32) drawing and marking; (33) pressing; (34) steaming; (35) folding or packing. Of these processes, more than half of which are effected by machinery, some are too simple to require particular description, while others are too technical to be well understood, except by actual observation of the processes themselves.

The sorting of the wool as determining the different qualities that shall be mixed for a given quality of cloth is important. In English factories the usual distinctions are into the grades known as prime, choice, superhead, head, downrights, seconds, fine abb. coarse abb, livery, and breech. After sorting the several packs of wool are separately scoured, washed, and dried. The scouring is effected by soaking the wool in stale urine, or in an alkaline lye heated to 120 degrees; the washing by placing the wool, after removal from the lye, within wire baskets in running water, or by rinsing in warm suds, and afterward in clean water; and the drying is much facilitated by subjecting the rinsed wool to pressure in passing it between iron rollers. If the cloth is not to be white it is either wool dyed or piece-dyed. If the former the dyeing follows directly on the scouring or washing. Common colours, as browns and olives, are dyed by the larger manufacturers; but the true colours, as blue, black, and green, and those of all cloths of the smaller manufactories, are left to the special dyers. The process of willying or twillying (a term probably derived from winnowing) is analogous to that of batting or scutching in cotton manufacture; the object is to disentangle and open the locks, and free them of sand or other loose impurities. One of the best forms of willy is that in which a hollow truncated cone, with four bars projected beyond, but running parallel to its surfaces, and armed with iron spikes, revolves 300 to 400 times per minute within an outer cylinder, armed on the inside with similar spikes. The wool, fed to the smaller end of the cone by an endless apron, travels in, revolving by virtue of centrifugal force to the larger; and after being thus opened and beaten up it escapes into a wire cylinder or receptacle provided with a fan, which blows away the disengaged dust, and finally lays the cleaned wool upon another apron in a continuous sheet. Coarser wools for cloth are willed more than once, sometimes before dyeing, and again after oiling and scribbling. Some larger impurities, such as the willy does not remove, as burs, pitch, or dirt, are then picked out of the wool while spread upon a wire screen, by boys or women; this includes both the picking and moating, the persons engaged being called wool-moaters. The wool is then spread upon a floor, sprinkled with olive oil, and well beaten with staves. It is thus prepared for the scribbling machine, the purpose of which is further to open and cleanse the fibres. This process is really a coarser carding, effected by passing the wool successively between several cylinders studded with rows of teeth or wires, and made to revolve rapidly; the wool is conveyed to the cylinders by an apron, and given forth at the last in a delicate sheet, which is wound on a revolving roller. This operation also may be repeated two or three times. From the carding machine, through which the wool is afterwards passed, it is delivered in the form of slender cylinders or pipes, called cardings. Slubbing, which is a preparatory spinning, is performed by the slubbing billy, and consists in drawing out and twisting the cardings to the state of a soft, weak thread. This is effected by means of several

spindles set nearly upright in a frame and receiving a turning motion, at the same time that the frame itself is made to recede (upon friction wheels running in rails beneath it) from a roller facing the spindles, and from which roller a carding is fed by the machinery to each spindle at the rate required; the spindles alternately draw out and wind the lengths of thread produced by the movement of the carriage, the entire action being quite similar to that of Hargreaves' spinning-jenny. The proper spinning consists in bringing the soft yarn thus furnished to the fineness and firmness necessary for weaving, and the machinery and operation are again quite similar to those employed in spinning cotton.

The operations of scribbling, carding, and slubbing are now, in all large factories, continuously performed, by means of Apperly's patent feeder and the so-called condenser, which has rendered the slubbing machine unnecessary. The waste resulting from the several processes is afterwards worked up into *shoddy*.

The next important stage is the conversion of the finished yarn into a textile fabric. [See WEAVING.] Formerly woollen cloths were principally woven by hand-weavers, but the power-loom is every year superseding more and more the common loom.

As the wool has been dressed with oil before spinning; and with size before weaving, it becomes necessary to cleanse it from these impurities immediately after the cloth has been removed from the loom. This is the object of a sound scouring process, in which the cloth is beaten with wooden mallets in a kind of trough or mill, an ammoniacal liquid being let in upon it first, and then clear water. Carried to the drying-room or the tenter-ground, it is stretched out by means of hooks on rails, and allowed to dry in a smooth and extended state. It is then taken and examined by the burler, who picks out all irregular threads, hairs, dirt, and knots or burls. After this it is ready for the important process of *fulling* or *milling*, which imparts to woollen goods that peculiarity of surface whereby they are distinguished from all others. A large mass of cloth folded into many plies is put into the fulling mill, where it is exposed to the long-continued action of heavy rollers. Superfine cloth undergoes four fullings of three hours each, a thick solution of soap being spread between the layers of cloth every time. This process, besides felted or interlacing the fibres together, thickens the cloth remarkably, but diminishes it about a fourth in length and in breadth nearly one-half.

In the fullled state the cloth presents a woolly and rough appearance, to improve which it goes through the operations of teazelling or raising, and shearing or cutting, the object of the first being to raise the ends of the fibres above the surface, and of the second to cut them off to a uniform level. The raising of the fibres is effected by thistle-heads, teazelling-cards, or wire-brushes. Teazels are the seed-pods of the *Dipsacus fullonum* [see TEAZEL], and are set in frames, arranged upon a large cylinder, the whole apparatus being called a *gy-mill*.

When the ends of the fibres have been thus raised to the surface they are next sheared or cropped, a process of great beauty and singularity. Originally it was performed by means of large hand-shears, the cloth being stretched over a stuffed table, and the workman proceeding to clip the ends of the fibres in a regular and equable manner; but it is now effected by a machine, in which a revolving iron cylinder furnished with spiral blades travels horizontally over the cloth, and shears it.

The cloth having been raised and sheared is brushed by a machine consisting of a system of brushes affixed to cylinders, being exposed at the same time to the action of the brushes and of steam. It is boiled or scalded to obtain a proper lustre, dyed, and finally subjected to the pressure of polished iron plates in a powerful hydraulic press.



forges, platform and main factory, the wheel factory being specially attractive. The pattern-room contains many interesting objects. The Laboratory Department contains the largest workshop in the world. In the Chemical Department all articles supplied for the army, including food, are tested. Near the proof-butts is the East Laboratory or Composition Department, where the small-arm cartridges are made, also the Rocket Factory, Detonating Sheds, and Cannon Cartridge Factory. The Artillery Barracks, the headquarters of the Royal Horse and Foot Artillery, are admirably situated, facing the common where all the artillery exercises and the great reviews take place. There is also a military museum, and the Royal Military Academy, where cadets are trained for the engineer and artillery services. Woolwich Dockyard was formerly used for the construction of ships for the Royal Navy, but was closed in 1869. The name Woolwich is believed to have been derived from *Wulewiche*, meaning in Anglo-Saxon the "Village in the Bay," the Thames making a curve near the town.

**WOO'RALL.** See STRYCHNOS.

**WORCESTER** (pronounced *Woo'ster*), the capital city of Worcestershire, a municipal and parliamentary borough, and the see of a bishop, 25 miles south-west of Birmingham by railway, 112 W.N.W. from London by the road, 130 by the London and North-western Railway, and 129 by the Oxford, Worcester, and Wolverhampton line, is situated on the east bank of the Severn, over which there is a handsome stone bridge of five arches, 270 feet in length, connecting the city with a suburb on the west bank. The country round is exceedingly beautiful and fertile. The Worcester and Birmingham Canal passes round the town on the east and south to the Severn. The older, central, and best part of Worcester is built on a ridge, which rises about 60 feet above the river, and terminates south beyond the cathedral, and north at the Barbourne Brook. The Lowesmoor valley sweeps round this ridge on the east, and extends to the Severn on the north and south. The worst parts of the city lie in this valley, and along the margin of the river towards the south. The houses are generally built of red brick; the cathedral, churches, and some of the public buildings of a reddish and rather soft sandstone. The principal streets are broad, clean, and well paved, and there is a good supply of water for the use of the inhabitants. There is, however, room for improvement in the drainage. The most important public edifice is St. Mary's Cathedral (originally a priory church), built in 1218-1386, in a beautiful situation on the west bank of the river. It is a double cross, in the early English style, is 394 feet long, with a tower nearly 200 feet high, and contains, among other monuments, those of King John, Henry VII.'s son Arthur, Judge Littleton, and Bishops Stillingfleet and Hough, the latter by Rouilliac. The exterior is of light and graceful architecture, and crowned at almost every angle with spire-like pinnacles. The interior presents a very beautiful appearance. A thorough restoration of the entire building was completed in 1875. Much of the embellishment of the interior was due to Lord Dudley, who paved the nave with marble, filled the great west window with painted glass, and decorated the roof of the aisles, transepts, chancel, and Lady Chapel. Within the precincts of the cathedral are the chapter-house, with a valuable library; the college hall or king's school, and the bishop's palace and chapel. In 1870 a fine peal of bells was placed in the tower. In addition to the cathedral Worcester possesses numerous churches, a Roman Catholic church, and numerous dissenting places of worship, several being of considerable architectural merit. The other interesting structures in the city are—the shire hall and courts, built in 1435, in the Grecian style, guild-hall, corn exchange, market-house, meat, cattle, and hop markets, natural history society, museum, city and county library, city

library and news-room, school of design, theatre, rebuilt in 1875, county gaol, Edgar's tower, the only remnant of the castle, Queen Elizabeth's free grammar-school, founded in 1561, where Lord Somers and Butler, the author of "Hudibras," were educated, king's or royal grammar-school, founded by Henry VIII., Bishop Lloyd's school, a college for blind sons of gentlemen, Queen Elizabeth's Trinity Hospital for twenty-nine women, with Wyld's free school attached to it, St. Oswald's chapel and hospital for twenty-eight women, endowed with an annual income of about £1700, Judge Berkeley's hospital and chapel, several almshouses, ophthalmic hospital, infirmary, penitentiary, dispensary, several banks, national, Lancastrian, and other schools, and county and city lunatic asylum in the suburbs, where also a public cemetery has been laid out. Worcester is the headquarters of the Provincial Medical Association of Great Britain; and among the benevolent institutions, besides those already mentioned, are lying-in and other medical establishments, a humane society, &c. The aggregate revenue of all its charities amounted to about £10,000 per annum.

The principal manufactures carried on in the city are those of porcelain and stone china, for which it has long been celebrated; it is the principal seat of the English leather glove trade, more than 500,000 pairs being made here every year; tanning and the currying of leather, coachbuilding, &c. There are extensive ironworks on the canal and river banks, where locomotive engines, agricultural implements, and nails are made, and two encaustic tile works; and manufactures of lace, boots and shoes, horse-hair, chemical manures, vinegar, British wines and spirits, the famed Worcestershire sauce, &c. Some splendid articles are produced at the porcelain works, and large numbers of women and girls are engaged in the glove factories. A brisk general trade is carried on in malt, corn, and hops, 20,000 pockets of the latter being sold weekly at the market in Foregate. There are also very extensive nursery grounds. Warehouses and quays border the Severn, which is navigable to Worcester for large barges. Several traces of ancient iron-smelting works have been found on the banks of the river; and the earliest names of the city, *Caer Guorangan*, *Weorganceastre*, *Wegenacestre*, &c., from which the modern one is derived, clearly imply that it was an old British settlement, and also at or near an important Roman station, the position of which is uncertain. Under the Mercian kings it became the seat of the diocese of *Huicra* or *Wicca*. It is mentioned at some length in the Domesday Survey, subsequent to which it was fortified with a Norman castle and a wall having six gates in it. Some ruins of the wall still exist. The chief historical event in the annals of the town is its occupation by Charles II. and his Scotch supporters in 1651, and their defeat by Cromwell in the battle fought on the 3rd of September in that year. The great Lord Somers was born at Worcester in 1652.

The parliamentary borough returns one member to the House of Commons. The population within the parliamentary and municipal limits was 31,227 in 1861. The parliamentary borough was afterwards extended, and had a population of 40,354 in 1881; the population of the municipal borough at the same time was 33,956. The municipal borough is divided into six wards, and governed by twelve aldermen, one of whom is mayor, and thirty-six councillors. The first charter of incorporation was given by Henry I. The spring and summer assizes and the courts of quarter sessions for the county are held in this city; it is also the head of an archdeaconry and deanery, and the seat of a county court. A celebrated triennial musical festival, the proceeds of which are applied to the relief of the widows and orphans of the clergy, takes place here alternately with Gloucester and Hereford; and music holds the first rank among general amusements.

The diocese of Worcester comprises the archdeaconries of Worcester and Coventry, in Worcestershire and Warwickshire. The bishop's income is £5000, and his country seat is at Hartlebury Castle, near Kidderminster.

**WORCESTER**, a city of Massachusetts, in the United States, 40 miles south-west of Boston, is a thriving manufacturing town, the second in wealth and population (68,383 in 1880) in the state. Its chief manufactures are boots and shoes, hardware, jewelry, stoneware, and carpets. The staple produce is iron and steel wire. It is regularly laid out, and has several noticeable erections, including a soldiers' monument, county court-houses, city hall, high school, several colleges, free library, with 70,000 volumes, and an asylum.

**WORCESTER COLLEGE**, Oxford (originally Gloucester Hall, which was established in 1283 for the use of the Benedictine monks of the monastery of St. Peter in Gloucester), was founded in 1714 for a provost, six fellows, and six scholars, the last to be elected from the schools of Bromsgrove, Feckenham, Worcester, Hartlebury, and Kidderminster, or, in default of persons properly qualified in these, from any other endowed school in the county of Worcester. The college afterwards received considerable endowments, until the number of fellowships was increased to twenty-one and the scholarships to sixteen, but they were much restricted by conditions of relationship and locality. There are now only nine fellowships, each tenable for seven years, and worth from £150 to £200 each. There are nineteen scholarships and several exhibitions.

Worcester College occupies two courts. The south side of the inner one still consists of the old buildings which belonged to Gloucester Hall. The chapel was begun, together with the hall and library, in 1720, and in 1864 was entirely remodelled. It is gorgeously decorated with mediæval groups on dead-gold ground, and the roof is richly ornamented in similar style, the whole after a design by Mr. Burgess. The fine tessellated marble pavement contains portraits of King Alfred, Bede, and many saints, including St. Oswald, St. Boniface, St. Gregory, &c. In the language of an ecclesiastical critic, Worcester Chapel is one of the richest interiors in the university, and one of the finest examples of the Renaissance in England. Among notable Worcester men are Coryate, the traveller; Lovelace, the poet; De Quincey, "the English opium-eater;" and Samuel Foote, the actor and dramatist.

**WORCESTER, FLORENCE OF**, one of our valuable early chroniclers. See FLORENCE OF WORCESTER.

**WORCESTERSHIRE**, an inland county of England, is bounded N. and N.W. by Staffordshire and Shropshire, E. by Warwickshire, S. by Gloucestershire, and W. by Herefordshire. There are several detached portions of this county; the most important contains the town of Dudley, and is surrounded by Staffordshire. The greatest length of Worcestershire, north-east to south-west, is 45 miles; the greatest breadth, east to west, is 34 miles. The area is 738 square miles, or 472,453 acres. The population in 1881 was 380,283.

*Surface*.—Worcestershire is generally a flat country; on the eastern and western sides are two nearly parallel ranges of hills, which partly bound and partly intersect it: most of the intermediate space is a fertile plain. The eastern range begins on the north in the Clent Hills, extends north-west of Bromsgrove, and terminates north of Evesham. The western commences in the neighbourhood of Bewdley, and runs south to the great chain of the Malvern Hills, in which it terminates. The principal elevations not comprised in or bordering on these chains are Bredon Hill, about 3 miles south of Pershore, Broadway, near the south-east extremity of the county, and a small line of heights extending from Croome northwards towards Worcester. The Malvern Hills are 1400 feet above the sea, but none of the other eminences in the county reach 1000

feet. Of the many extensive and beautiful vales, the principal is that of the Severn, which is 30 miles long.

*Geology*.—The geology of Worcestershire has been fully detailed by Sir Roderick Murchison in his valuable work on the Silurian system ("Siluria," ed. 1868). It is composed for the most part of new red sandstone, lias, and oolite; other formations are visible in the chains of the Malvern Hills, in the districts bordering on Tenbury, Bewdley, and Dudley, and in the Lickey and neighbouring hills on the north part of the county. The new red sandstone comprehends that district which is watered by the Severn, together with the north-east part of the shire. The lias formation is found at Pershore and Evesham, and in the vales watered by the Avon. The portion of the Malvern Hills within the boundary of this county consists of trap; while the Silurian rocks, the Caradoc sandstone, Ludlow rock, and Wenlock limestone appear in the northern portion of the chain. The lower coal and ironstone beds occur at its termination, north of Abberley Hill, in the forest of Wyre. Here also is found the old red sandstone formation, upon which Tenbury stands. Bewdley is situated near the junction of the lower red sandstone with the coal-field of the forest of Wyre. The town of Dudley is in the midst of the thicker coal-measures, and mining is very extensively carried on there. In the neighbourhood of Droitwich and Stoke Prior occur saliferous beds, from which a large quantity of salt is manufactured. Building stone and clay are the only other minerals. The mining statistics of Worcestershire are included in the official returns with those of Staffordshire. The salt works of Stoke Prior are the deepest in England, and cover 17 acres. From them and the Droitwich works a great quantity is raised annually.

*Rivers, &c.*—Worcestershire is well watered. The principal rivers are the Severn, the Avon, the Teme, and the Salwarp. The Severn, which traverses the county from north to south nearly in the centre, is described under SEVERN AND WYRE. The Avon enters Worcestershire on the east, near Cleeve Prior, and flowing in a very winding course past Evesham and Pershore, quits it about a mile from Tewkesbury, and soon afterwards falls into the Severn. It has been rendered navigable by locks throughout the whole length of its course in this county, which is nearly 20 miles. Barges of 60 tons can reach Stratford-upon-Avon. The Teme, which bears somewhat of the character of a mountain stream, and is not navigable, enters Worcestershire at its western extremity, and passing by Tenbury, forms here, as during other parts of its course, the boundary between this county and Herefordshire. It falls into the Severn about 3 miles south of Worcester. The Salwarp, a small river, rises north of Bromsgrove, flows through Droitwich, and falls into the Severn near Claines.

The county is well supplied with railway accommodation by means of the Midland, North-western, and Great Western lines.

*Climate, Soil, Agriculture, &c.*—The climate of Worcestershire, especially in the middle, south, and west of the county, is remarkably dry, mild, and healthy, and the agricultural productions are brought to early maturity. The rainfall is exceedingly small, being lower than that of almost any other district in England. The vales of Severn and Avon are but little raised above the level of the sea; and it has been observed that an elevation of 60 yards makes a difference in climate equal to a degree of latitude north, soil and other circumstances remaining the same. The higher parts of the county, between Bromsgrove and Birmingham, have consequently a later harvest. The still higher lands, such as the Malvern Hills, are proportionally colder and later; but, on the other hand, they tend to shelter the intervening vales from the cold winds, and add to the mildness of the climate therein. Much of



the surface is finely wooded. The Vale of Severn contains some extremely rich alluvial soils, which are admirably adapted for pasturage. The banks of the Avon are also rich, and consist mostly of meadows and pastures. One-half of the county consists of rich loams and clay soils. Potatoes are raised in great abundance for the supply of Birmingham and other large towns. Wolverley sands have long been famous for the growth of carrots and for raising carrot seed. The ground is trench-ploughed. The banks of the Teme are lined with apple and pear orchards and hop gardens. The produce of the latter is considered by brewers to rank next to that of Kent. The Vale of Evesham produces abundance of fruit and vegetables of the finest quality. There is no peculiar breed of cattle. They are chiefly obtained from Herefordshire and South Wales, and are fattened in large numbers on the fine pastures and meadows on the banks of the Severn and Avon. Dairy farming is also carried on to a considerable extent. The sheep are mostly of the Leicester breed, which suits the rich pastures. On the Malvern Hills are some small hardy sheep, without horns, and with gray faces and legs, which make excellent mutton. Pigs and poultry are reared and fattened in large numbers. The horses for farm work are mostly of the strong black breed.

**Manufactures, &c.**—The chief industrial occupations in the county are coal and iron mining, and the manufacture of glass and iron at Dudley and Stourbridge; nail-making at Broomsgrove; salt-refining at Droitwich; carpet-weaving at Kidderminster; the making of needles at Redditch, and porcelain and gloves at Worcester. Large quantities of cider and perry are produced in some of the rural districts, and the British wine and vinegar manufacture of Worcester is the largest in the kingdom.

**Divisions.**—Worcestershire is divided into five hundreds and 249 parishes. It is in the diocese of Worcester, except a small portion, which is in that of Hereford, and in the Oxford circuit, the assizes being held at Worcester. For parliamentary purposes it is divided into five divisions, each of which returns one member, besides which one member each is returned for Worcester, Dudley, and Kidderminster.

**WORDE, WYNKIN DE**, one of the earliest English printers, was born in Lorraine about the middle of the fifteenth century. He accompanied Caxton to England, and was his assistant till his death, about 1491, when he succeeded to his business. He made great improvements in the art, introducing Roman letters and cutting many new fonts of all sizes, and of greatly improved appearance. He also supplied type to other printers, who soon became numerous. He was the first in England to use Greek type, some of which is introduced into his "Instructions for Pilgrims to the Holy Land" (London, 1523); and he afterwards made use of Arabic and Hebrew characters, which were cut on wood blocks. Between 1491 and 1534 he published 408 distinct works, most of them remarkable, at that period, for neatness and elegance, and many illustrated by wood engravings, said by Jackson ("History of Wood Engraving") to have been executed in England. He died in London about 1534.

**WORDS WORTH, WILLIAM**, an eminent English poet, was born at Cockermouth, in Cumberland, on the 7th April, 1770. His father, John Wordsworth, was an attorney, and the agent of Sir James Lowther, the first Earl of Lonsdale. He received the rudiments of education at Penrith, but after the death of his mother, in 1778, was removed to the grammar-school of Hawkshead, near Lake Windermere. He had already displayed a poetical bias, learning little Latin and less Greek, but poring indefatigably over the works of Cervantes, Swift, Pope, Gray, Goldsmith, and Fielding. He pursued a similar course of study on entering St. John's College, Cambridge, and consequently, in the four sessions he spent in its classic shades, earned no scholastic distinctions.

In 1790 he visited Switzerland with a fellow-collegian, and in 1791, after taking his degree, he spent some time in France, where, through his strong liberal sympathies, and the intimate connection he formed with some of the leading Girondists, he so far compromised himself that, had he not been compelled to return to England, he would probably have incurred the vengeance of the extreme republican party.

Wordsworth's first appearance as a poet was made in 1793, when he published an "Evening Walk" and "Descriptive Sketches." Novel in tone and construction, they passed unnoticed by the great body of the reading public; but their fine spirit was recognized by a few choice critics, and, among others, by Samuel Taylor Coleridge, who observed that "seldom, if ever, was the emergence of an original poetical genius above the literary horizon more evidently announced." A legacy, by a friend named Raisley Calvert, to whom he had been an attentive nurse, opportunely placed him in possession of a sum of £900; by the assistance of which he and his only sister, Dorothy, retired to live a truly Arcadian life at Racedown in Dorsetshire, and afterwards at Alfoxden, in Somersetshire. Here he was in close contact with Coleridge, and the first fruits of the intimacy of the two bards were the "Lyrical Ballads," published in 1798 by Joseph Cottle, of Bristol.

To this volume Coleridge contributed his "Ancient Mariner," of which much of the plan, and some half dozen lines were due to Wordsworth. "The sale was so slow," wrote the publisher, "the severity of most of the reviews so great, that its progress to oblivion seemed to be certain. I parted with the largest portion of the 500 copies at a loss." That a volume containing Coleridge's "Ancient Mariner," and Wordsworth's "Lines composed a few miles above Tintern Abbey," should have been so much ignored, is one of the ironies of literary history.

During a short residence at Goslar, in Germany (1798-99), Wordsworth wrote "Lucy Gray," "Ruth," and "Xuthus." On his return from the Continent, in 1799, the poet took up his abode with his sister first at Sorleburn near Scarborough, and afterwards at Grasmere, in the Lake Country, a district ever afterwards to be associated with his name. In 1802 he married Miss Mary Hutchinson of Penrith, with whom he lived very happily for his remaining forty-eight years of life. She brought the poet five children, of whom Thomas and Catherine died when young, and his beloved daughter Dora in 1847; John and William survived their father. The winter spent at Coleorton in 1806; his removal to Allan Bank in 1808; to the Grasmere rectory in 1811; and finally to Rydal Mount in 1813; his appointment as distributor of stamps for Westmorland in this latter year; his public acceptance, in 1839, of the degree of D.C.L. from the University of Oxford; and his accession to the laureateship on Southey's death, in 1843, are the most important events of Wordsworth's later life, apart from his poetic achievement.

The "Prelude," in which he traces the history of his mind, was written between the years 1799 and 1805, but was not published till after Wordsworth's death. From it he passed to the "Excursion," which was originally intended to form part of a still lengthier poem, the "Recluse." The "Recluse" was, however, never finished, and the "Excursion" appeared in 1814. It was followed a year later by the "White Doe of Rylstone" and "Laodamia." His last poem, an "Ode on the Installation of Prince Albert as Chancellor of the University of Cambridge," was written in 1847. It is impossible, within the space at our disposal, to give the titles and dates of his numerous poems, more especially as the date of composition rarely coincides with the date of publication. For example, the famous "Ode on Intimations of Immortality from Recollections of Early Childhood," was begun in 1808, finished in 1806, and published in 1807.



It has been pointed out by Mr. Matthew Arnold that all Wordsworth's best poetry was produced between the years 1798 and 1808, and this is but to say that it was coincident with his enthusiasm for liberty, and his sympathy with the aspirations of a great nation engaged in working out its destiny through revolution. Sir George Beaumont, in 1809, warned Haydon the painter against Wordsworth's "terrific democratic notions;" but even then the reaction was setting in which left him, as it left Southey and Coleridge, a staunch supporter of Church and Crown.

With Wordsworth the youthful revolutionist, who wished that his own much-loved country might be defeated when engaged in what he believed to be an attempt to strangle the new-born republic, or with Wordsworth the Tory Churchman, who looked with horror on the first Reform Bill and Catholic Emancipation, the lover of good literature is little concerned, except so far as the poet's personality is reflected in his work. But when Wordsworth had lost his enthusiasm for human progress his song lost that spontaneity which is of the essence of all true poetry. Robert Browning has deplored the change in his "Lost Leader," and Shelley also, in imperishable lines:—

"Thou wert as a lone star, whose light did shine  
On some frail bark in winter's midnight war;  
Thou hast like to a rock built refuge stood  
Above the blind and battling multitude:  
In honoured poverty thy voice did weave  
Songs consecrate to truth and liberty,—  
Deserting these, thou leavest me to grieve,  
Thus having been, that thou shouldst cease to be."

While rendering all homage to the fervent loyalty to humanity which characterizes Shelley to the very end of his too brief career, we may yet hesitate to judge Wordsworth's change of view too harshly. He came to believe that the world's progress, to be effective, must be gradual, and is not so much a matter of government as of personal character. The most enthusiastic social reformer will now allow, that, whilst we need consistent champions of human rights like Burns, Byron, and Shelley, we need also the teachers who will make us, as individuals, more worthy of such rights.

More than any other poet Wordsworth has profoundly influenced the course of English poetry, by lifting it out of the deep ruts of eighteenth-century conventionalism to simpler and truer methods.

"Pedlars and pots and waggons! oh, ye shades  
Of Pope and Dryden, have we come to this?"

was the sarcastic criticism of Byron. But none the less did Byron allow himself to be influenced by the great nature poet, and Shelley, Keats, and Tennyson have acknowledged the potency of the same spell. His "Lyrical Ballads" were written, he says, "as an experiment, to ascertain how far, by fitting to metrical arrangement a selection of the real language of men in a state of vivid sensation, that sort of pleasure and that quantity of pleasure may be imparted, which a poet may rationally endeavour to impart." This was his theory of "poetic diction," about which so much has been written, and which brings Wordsworth into so great an antagonism to Pope and his school. Wordsworth did not, however, confine his vocabulary to the language of common life, but had himself also a "poetic diction" of the most vivid and forcible character. It is not only in directness and severe simplicity that Wordsworth founded an anti-Augustan school, but also in his love of nature and his profound spirituality. Addison once wrote of "a very troublesome journey over the Alps. My head is still giddy with mountains and precipices; and you can't imagine how much I am pleased with the sight of a plain!" and all Addison's contemporaries wrote or thought thus. Wordsworth changed all this. So entirely did he feel with nature that he may be said to

have made a new literary religion for thoughtful Englishmen by the powerful expression which he has given to her every aspect:—

"To me the meanest flower that blows can give  
Thoughts that do often lie too deep for tears."

His profound spirituality, again, places him upon an entirely different level from Pope, to whom, however, our own age is inclined to do full justice for his extraordinary power as an artist. "To come under the rule of Wordsworth," says Mr. Matthew Arnold, "is to come under the rule of poverty, chastity, and obedience." He calls us always to "plain living and high thinking;" he is monastic in his purity; and ever strives to live the "bondman of duty in the light of truth." "There are born Popists or Wordsworthians, Lockists or Kantists," says Mr. Lowell, "and there is nothing more to be said of the matter;" but it is no mere fashion which has given Wordsworth his present position. An age so distracted by doubt and disputation as our own requires something more than smooth and polished versification; it needs the "soothing power" which Wordsworth alone among our poets can give. In short, it is not too much to claim for him that he is in many respects the greatest and most valuable British poet since Milton. His youthful tragedy of the "Borderers" shows how much he lacks dramatic power, and he was certainly deficient in many of the other fine qualities of Shelley and Byron. To some extent he also lacks the broad human aspirations which make those poets the prophets of religions and spiritual freedom, nor had he Keats' artistic sense. It is, nevertheless, an entire mistake to represent Wordsworth as a poet of nature and nothing more. He is essentially a poet of humanity, and, above all, of animal life, which becomes more sacred when we have learnt from him

"Never to blend our pleasure, or our pride,  
With sorrow of the meanest thing that feels."

Humanity is ennobled for us when we recognize that high thoughts and manly independence may be the lot, not merely of the cultured few, but of simple dealers and of humble leech-gatherers. No modern poet has written so exquisitely on woman; no modern poet has depicted with such depths of feeling and passion the love of parent for child, of child for parent. Such poems, moreover, as the "Highland Girl" and the "Highland Reaper" linger in the memory for ever. Keble, the author of the "Christian Year," claimed for him "that he had shed a celestial light upon the affections, the occupations, and the piety of the poor." He has been truly a helpful guide, an invigorating moral teacher. "No modern Englishman," says the author of "Natural Religion," "has done so much to redeem our life from vulgarity." A thousand testimonies might be produced to show how much he has inspired and helped nearly all the best men of his own and later times. Coleridge and De Quincey, John Stuart Mill, and Charles Kingsley are among those who have made specific acknowledgment of what they owe to him. Moreover, it can hardly be disputed that his earlier sonnets take rank next in importance to those of Shakespeare and Milton, and Emerson says that "the 'Ode on Immortality' is the high-water mark which the intellect has reached in this age."

It was Wordsworth's ambition that his writings might be efficacious in making men wiser, better, and happier. There is abundant evidence that they have done so, and that to no poet can his own beautiful lines more fittingly apply:—

"Blessings be with them—and eternal praise,  
Who gave us nobler loves and nobler cares,  
The poets, who on earth have made us heirs  
Of true and pure delights by heavenly lays!"

Wordsworth's "Memoirs" were written by his nephew, Bishop Wordsworth, but as the bishop confessed that he

had to "get up" his uncle's poetry for the occasion, it is not surprising that he produced a work which takes rank with Hayley's "Life of Cowper" as one of the worst biographies in the English language. Lives of the poet by January Searle and Edwin Paxton Hood have long since gone out of print. The best life of Wordsworth until the appearance of the authoritative biography by Professor William Knight, is the small monograph in Macmillan's Men of Letters Series by F. W. H. Myers. Myers' life is so beautifully written that it constitutes a poem in itself, but it idealizes the poet's life too largely. The Wordsworth whom De Quincey, Carlyle, and a host of other contemporaries have made known to us, is a less amiable person than Mr. Myers depicts. See also J. G. Lockhart in the *Quarterly Review*, Crab Robinson's "Diary," De Quincey's "Recollections of the Lake Poets," Carlyle's "Reminiscences," Dorothy Wordsworth's "Tour in Scotland," Knight's "The English Lake District as interpreted in the poems of Wordsworth," "Through the Wordsworth Country," and "Memorials of Coleridge" (1887). "The Prose Works of Wordsworth," edited by the Rev. A. B. Grosart, were published in 1875. Wordsworth's "Guide to the Lakes" is still very serviceable. There are many editions of the poems, of which Professor Knight's eight volumes is the best; but whilst a veteran admirer will not fail to secure the complete works with Wordsworth's notes, most people will do well to be satisfied with Matthew Arnold's admirable little volume of "Selections," in the Golden Treasury Series, or the volume of "Selections" (1888) prepared by Professor Knight, assisted by Robert Browning and some members of the Wordsworth Society. These collections contain nearly all that is of permanent worth. The longer poems, the "Excursion" and the "Prelude," have, notwithstanding some cases, none of the characteristics of enduring literature. A Wordsworth Society was founded in 1880, and dissolved in 1886, having in the meantime published many valuable transactions, and listened to interesting addresses by Matthew Arnold, James Russell Lowell, Lord Houghton, and other well-known men. For criticism, see S. T. Coleridge's "Biographia Literaria," Matthew Arnold's introduction to his "Selections" and "Memorial Verses," Lowell's "Among my Books" and "Democracy and other Essays," Stopford Brooke's "Theology in the English Poets," F. W. Robertson's "Lectures and Addresses," J. C. Shairp's "Studies in Poetry and Philosophy," R. H. Hutton's "Essays," Bagehot's "Literary Studies," Hudson's "Studies in Wordsworth," Aubrey de Vere's "Essays," and De Quincey's "Miscellaneous Works."

**WORKINGTON**, a seaport town of England, in the county of Cumberland, 7 miles north-east of Whitehaven, and 310 miles from London by rail, situated at the mouth of the Derwent. The town owes its prosperity to the coal mines in its vicinity, and it has iron-smelting works, steel and iron works, a paper mill, and some shipbuilding. It has two churches, a fine Roman Catholic church, and a corn-market. The harbour was greatly improved in 1873. The fishing village of Workington was the spot where Mary Queen of Scots landed on her flight from Langside in 1568. The population of the town in 1881 was 14,371.

**WORKSOP**, a town of England in Nottinghamshire, situated in the district known as the "Dukery," from the number of man-sions and parks in the vicinity, 147 miles from London by rail. It has manufactures of chairs, railway sleepers, and agricultural implements, and a trade in malt and timber. The chief buildings are the parish church, town hall, corn exchange, and ancient moot hall. The population in 1881 was 10,588. Mary Queen of Scots was confined for a time in the old Worksop Manor.

**WORLD, MAP OF THE.** The map of the world prefixed to this volume scarcely needs more explanation than that which it affords within itself. The reader will

at once perceive how the long mass of Europe and Asia is backboned, so to speak, by a series of mountain chains trending generally east and west, while the Americas and Africa have their mountain chains north and south. Also the curious parallelism between the western coast of the Old World, convex above, concave below, and that of the eastern coast of the New World, concave above, convex below, is seen to make the Atlantic a sort of sinuous channel. The great masses of land lie to the north, as is strikingly shown by the smaller figures beneath, giving the north and south hemispheres cut at the equator. If the earth be cut by a plane a little tilted to the equator, so that London occupies the same place with regard to it that the north pole does with regard to the equator, then a still more remarkable division is made with regard to land and water. There is no doubt that this central position of London in regard to the land of the globe has had much to do with its wonderful prosperity.

The diagram showing the relative heights of mountains and plateaus and depth of sea bottom is also very instructive. The highest mountain is among the Himalayas, the deepest sea is in the South Atlantic.

**WORMS**, formerly an important free city of the Germanic Empire, but now a decayed town in Hesse-Darmstadt, is situated near the left bank of the Rhine, and 25 miles south from Mayence, with which it communicates by railway. In 1880 it had 19,000 inhabitants. The city is said to occupy the site of the Roman fortress Borbetomagus, or Augusta Vangionum, which was destroyed by the Vandals and Huns. The town was rebuilt by the Franks about 475, and called Worms. It was for some time the residence of Charlemagne, who held in its vicinity those primitive legislative assemblies which, meeting in May, were called Champs de Mai. Several diets of the German Empire were held at Worms—among others those of 1495, convoked by Maximilian I., and of 1521, at which LUTHER appeared before the Emperor Charles V. The population of the city in the thirteenth century amounted to 60,000, and even after the Thirty Years' War it was still 30,000. In 1689 it was burnt by the French, and only the old cathedral was spared. Since that time it has never recovered; some portions have indeed been rebuilt, but within the old circuit of its walls are now large vineyards and gardens. The most remarkable edifice is the dom, or cathedral, which has ten towers, and is externally one of the finest Romanesque buildings in the world. There are five other churches and two synagogues—one of the latter being at least 800 years old. A magnificent monument to the memory of Luther and his fellow reformers was completed in 1868. The Rhine is crossed by a swing bridge. Worms has a gymnasium, manufactories of sugar of lead and tobacco, several taneries, and a good trade in corn, cattle, and wine. The highly esteemed *Lichfrauenmilch* wine is made from grapes grown on a hill near the cathedral.

**WORMS**, as a disease. The intestinal canal is often the seat of worms, which intensify or excite gastric and intestinal disorders by their direct action, while indirectly the irritation they produce may be the cause of serious nervous symptoms. The *Ascaris vermicularis*, or small thread worm, is the most common in this country, young children chiefly being affected. Their true habitat is in the cæcum, but from their tendency to migrate they are frequently found in the lower bowel, and they occasionally pass into the vagina, where they may give rise to Leucorrhœa. When only a few are present, they cause but little inconvenience, but when they are numerous they cause excessive itching or tickling of the back passage, which is always worse at night. Sometimes they give rise to troublesome diarrhœa and straining at stool, and they frequently bring about much nervousness and irritability, involuntary spasms, convulsions, and chorea.

Treatment consists in the administration of small doses

of steel, followed by brisk saline purgatives, and the injection into the back passage of cold water, cold water combined with a little tincture of steel, in the proportion of a tablespoonful of the latter to a pint of the former, salt and water, or infusion of quassia. The patient must avoid touching the back passage, and a local washing should be practised, where possible, after the act of defecation, and nightly at bedtime whether or not enemas be employed. Persons suffering from this affection should sleep alone, and the hands should be washed before meals, as it has been observed that the germs of the parasites are often conveyed to the mouth by the hands or nails of the sufferer. The Round Worm or *Ascaris lumbricoides*, another common parasite, has been noticed elsewhere. [See ASCARIS and ROUND WORMS.] The TAPE-WORM, which also is described under that heading, occurs most frequently where much pork is consumed, especially where the meat is eaten in an underdone state. It is also often communicated by the eating of underdone beef, and in Abyssinia, where beef is eaten raw, hardly a single person escapes the parasite. The symptoms of the presence of a tapeworm in the intestines are pains in the abdomen, variable appetite, diarrhoea, or its opposite constipation, craving for food, debility, irritability of the bladder, and itching of the nose and back passage. Happily there are numerous medicines which have the effect of destroying and expelling the worm without injury to the patient, those most commonly employed being the oil or extract of male shield-fern (*Lapidium filix mas*), the infusion of the bark of the pomegranate root, the oil of turpentine, pumpkin-seeds, araca nut, and kousso, the latter being the favourite remedy in Abyssinia. Probably the best, on the whole, is the oil or extract of male fern, which should be taken in a dose proportioned to the strength of the patient, a few hours after a full dose of castor-oil has been taken, and upon an empty stomach.

When the worm is expelled it should be covered with a solution of carbolic acid, so as to insure the complete destruction of the ova, and the head should be carefully sought, for if that remains there may be a speedy return of the troublesome symptoms.

**WORMS.** See ANTHELMINTICS, VERMES, EARTH-WORM.

**WORM WOOD.** See ARTEMISIA.

**WORTHING.** a modern watering-place of England, in the county of Sussex, 11 miles west from Brighton, and 61½ from London by the South Coast Railway, extends along the coast for about a mile, and has several good streets running in a northerly direction. There are numerous hotels, libraries, reading and news-rooms, and other accommodations incident to a fashionable watering-place. The esplanade extends along the shore for the whole length of the town, and a handsome pier was erected in 1866. There are fine sands along the coast for 7 miles to the west, and 3 miles to the east of the town. The excellent facilities for bathing at any time of the tide, added to the mildness of the climate, which is, however, humid and relaxing, in consequence of the shelter afforded on the north and east by the South Downs, render Worthing especially suitable as a place of resort for some invalids. There are two churches and several chapels and schools, a bank, theatre, and baths of all descriptions. The rise of the town from an insignificant village into a favourite watering-place was mainly due to the frequent visits of George III. Some splendid houses have been built at the west end of the town, known as West Worthing. The population in 1881 was 10,967.

**WOTAN** (*Woden*, *Wuotan*, and in Scandinavian *Odin*) is the Zeus of the Norse Olympus, and like him is called "All-Father." In the article ODIN the question of a historical chief of this name is briefly discussed; the statements as to the mythical Odin are certainly as definite as those about our own semi-mythical Arthur, and it is of

course not only possible, but even likely, that a chief so great as to found a powerful nation might be revered after his death as a god. Indeed we need not go to the prehistoric traditions of uncivilized nations for this, since the very same thing was done both with the ancient kings and with many of the emperors of Rome, and (as to the latter particularly) deification became one of the recognized habits of a great nation.

But the meaning of the word Wotan is rather against this; it is the Teutonic equivalent of the classic *Vadere*. That is, it is the moving, acting, life-giving breath of heaven, corresponding in word meaning to Brahman Atman, the Hindu "Breath of life" (Teutonic *Athem*), and to the Hebrew "Spirit" (*Spiritus*, a breath). Zeus, as a name, refers rather to the brightness of heaven than to the breezes of it; but Wotan and Zeus, names apart, are almost similar in attributes. Wotan, it is true, does not wield the thunder, that is given to Thor, and he is the god of light, while Zeus parts with that attribute to Apollo. When Wotan brandishes his spear then flash the rays of light over the world, those rays which to the Greeks were the arrows of the "far-darting Phoebos-Apollon." Wotan, too, is a great warrior, and leads armies to battle, a veritable Lord of Hosts; while Zeus leaves this attribute to Arès. Both Wotan and Zeus are the personification of the broad blue bright sky, and rule the rain and the sunlight alike. Both also developed from the all-pervading ever-present air, into the more spiritual conception of the all-pervading, ever present mind. Zeus and the Muses, when the goddess Mnemosunè (Memory) bore him, have their parallels in Wotan and his daughter Saga, inspirers of poetry, his two ravens (Thought and Memory, *Hugin* and *Munin*), who perched one on each shoulder, to tell him every morning all that was passing in the world. Jupiter (the Latin Zeus) had the most glorious planet named after him, Wotan the finest constellation. *Wotan's Car* is what we call the Great Bear, and is one of the few constellations always visible, at any time of the night and in all periods of the year.

Wotan, as we know him, makes a splendid figure; his golden ring Draupnir on his arm, his spear Gungnir in his right hand, his golden helmet and shining breastplate of mail, and his flowing mantle, are always vividly before us.

The consorts of Wotan were Frigg and Freya. The first shared with Wotan his throne Hlidskialf, and span the thread of fate, while he thence surveyed the whole world: the second (notably a development of the first, or *vice versa*, rather than a separate personality) was of another race than Wotan, namely the WAKES. She presided over sunshine, rain, and harvest, and half the heroes who fell in battle passed into her care, to be borne by the Battle Maidens to Walhalla, the heaven of heroes.

Wotan is further credited with pledging one eye to Mimir, guardian of the fountain of primeval wisdom, for liberty to drink thereof, in manifest reference to the one great eye of heaven, the sun (Wisdom lay in the fountain because the world sprang from water). The eye Wotan pledged became a curved cup, which he drank from (the crescent moon), and this changes back to the eye form (full moon), but is lost in the ocean every morning at its setting. Wotan, thus inspired, discovered the runes—the Norse alphabet; and he discovered also poetry and song, and their power. Like Apollo and Orpheus, he could make all nature dance to his music. His runic chants blunted the weapons of an opponent, stopped the deadly arrow in its flight, stilled the angry waves, and, what is more wonderful, the angry passions of excited men.

Even more than Zeus is Wotan the "father of gods and men" in the Norse Olympus. Thor was his son by Jörd (the earth), Baldur, the beautiful, and Hödur were his sons by Frigg, and Rinda bore him Wali, avenger of Baldur, &c. Men also he created by his own power.

**WOTTON-UNDER-EDGE**, pronounced *Wooton*, a town of England, in the county and 18 miles south by west from Gloucester, situated near the base of a ridge of wooded hills, whence it derives its name. The old town was burnt down in the reign of King John. The present town is well built, and contains a handsome old church. There is a market-house, to which a town-hall was added in 1872, a well-endowed free-school, and literary institute. Wotton is one of the clothing towns, and has several mills. The Little Avon, which falls into the Severn near Berkeley, runs by the town. The population in 1881 was 3349.

**WOU'WERMEN, PHILIP** (often called *Wouwerman*), the son of a painter, Paul, was born at Haarlem in 1619, and is said to have studied his art under Wynants. He displayed great ability, yet was unable to sell his pictures advantageously, and was obliged to dispose of them to the dealers. Now that fame cannot aid him his works are sought after. His subjects are commonly road-side scenes, hunts, or fights, and he often introduced a white horse in his pictures. He died at Haarlem on the 19th of May, 1668. Wouwerman is said to have been so dissatisfied with his own career that before he died he destroyed his studies and sketches, to prevent his son following the career of a painter. It is quite clear that Wouwerman cannot in his comparatively short life have painted all the 900 pictures now attributed to him. His style is very masterly, his execution being, indeed, very near perfection, his figures elegant and spirited, and his landscapes always well chosen.

**WRACK** or **WRECK** is a popular name for the marine vegetation cast ashore by the waves, and often specially applied to the seaweeds of the genus *Fucus*. See *FUCACEÆ*.

**WRANGLER**, a word derived from the public disputations in which candidates for degrees were formerly required to engage, as a test of their abilities. It is now used at the Cambridge University to designate those who achieve first-class honours in the public mathematical examinations (mathematical tripos), which are confined to pure and mixed mathematics, and are continued through eight days. All those gentlemen who are successful in the first three days are entitled to the degree of Bachelor of Arts. The examinations on the remaining five are only undergone by those competing for honours, the successful candidates for which are divided into *wranglers*, *senior optimes*, and *junior optimes*. The student passing highest in the first-named is called senior wrangler. In 1887 was seen the curious phenomenon of four senior wranglers, the first four men having received from various sources precisely the same number of total marks. The number of wranglers is not limited. The last of the junior optimes is popularly known as the "wooden spoon," and at the yearly presentation for degrees a huge wooden spoon is usually, with great solemnity, lowered down to him from the undergraduates' gallery.

**WRASSE** (*Labridæ*) is a family of fishes belonging to the order *ACANTHOPTERYGII*, and the type of a section *Pharyngognathi*, having the lower pharyngeal bones fused together. The wrasses have an oblong or elongated body covered with cycloid scales. There is a single dorsal fin with a well-developed spinous portion; the ventral fins are thoracic in position, with one spine and five soft rays. The mouth is protrusible, with thick fleshy lips, which are sometimes internally folded, so as to appear double. The wrasses feed chiefly on molluscs and crustaceans, their broad molar-like pharyngeal teeth being well adapted for crushing shells. Some species have a strong curved tooth at the hinder end of the premaxillary bone, between which and the lateral and front teeth they can press a shell and crush it. Some feed on corals and small marine animals, and a few on seaweeds. The species are very numerous, and abound chiefly in temperate and tropical seas near the

coast. Many are adorned with beautiful colours. Some of the species attain a large size, and are esteemed for the table. The Ballan Wrasse (*Labrus maculatus*), one of the best known species, is common on the coasts of Britain and Europe, ranging into the Mediterranean. It is usually about 18 inches in length, and weighs about 3 lbs., but sometimes grows much larger. It varies somewhat in colour, but is usually reddish on the back and orange on the belly, the whole body being adorned with bluish-green spots; the paired fins are orange-red, and the vertical fin usually bluish-green. It is found among seaweeds in deep holes in the rocks. The Cook Wrasse (*Labrus mixtus*) is found in Britain, chiefly on the southern coasts of England; it also occurs on the coasts of Europe and in the Mediterranean. This species is remarkable for the difference in the colours of the two sexes, which is so marked that they have been sometimes described as distinct species, the male being called the Striped Wrasse, and the female the Red Wrasse. The male is dark-greenish above, yellowish below, striped transversely with blue; the female is red, with two or three black blotches across the back of the tail. This species attains a length of 12 or 14 inches. The Corkwing or Goldsinny (*Crenilabrus melops*) is a nearly allied species common on British coasts. It is about 5 inches long and has a deep body, purplish on the back, greenish below, and striped longitudinally with violet and red; the pectoral fins are reddish-yellow, and the other fins greenish. The Tautog or Blackfish (*Tautoga Americana*), another allied species, is much esteemed in the United States for food. Several other nearly allied species occur on British coasts. The Rainbow Wrasse (*Coris julis*), a Mediterranean species, is occasionally taken on our southern coasts. A large group of this family, known as *PARROT-WRASSES*, belong to the genus *Scarus* and other allied genera.

The nearly allied family *Embiotocidæ* are remarkable for being viviparous, the young being developed within the ovary. They are also small fishes inhabiting the temperate North Pacific Ocean. Two other families belong to the section *Pharyngognathi*, *Pomacentridæ* and *Chromidæ*.

**WRECK** signifies in our law such goods as after a shipwreck are cast upon the land by the sea, and left there within some county, for they are not *wrecks* in the jurisdiction of the Admiralty so long as they remain at sea. Where such goods are cast from a wrecked ship into the sea, and then sink and remain under water, they are called *jetsam*, or thrown goods, unless when mariners in danger of shipwreck throw the goods, being heavy, into the sea, with a cork or buoy attached to mark the place where they sink that they may be found again. Goods found floating on the sea after a ship has sunk or been cast away are called *flotsam*. The term *derelict* is also applied to goods wilfully forsaken or left, or cast by the sea on to the shore above water-mark.

The old English law relating to wrecks was founded upon principles analogous to those by which the seaman who fell overboard was punished by his captain for being out of the ship without leave. If a merchant was so unfortunate as to lose his ship, and the wreck was cast upon the shore, it was claimed by the king, as the ultimate owner of everything in his kingdom, on the ground that the merchant had evidently parted with his property. It made no difference if the merchant was known, or if he came ashore himself out of the wreck; the law completed the ruin which the elements had hesitated to finish; and the poor wretch was obliged to submit to a spoliation which must have made him regret his advent to the inhospitable shore.

The harshness of the law was somewhat modified by Richard I., whose "Laws of Oléron" were about the first merchant shipping Acts ever passed. They were the model upon which all maritime codes were formed in Europe, and they remained in force, supplemented by a few explanatory

statutes, till quite modern times. In George II.'s reign it was found to be necessary to remodel the law of wreck in many particulars, and death was prescribed for those who stole things from a wreck, and for those who killed or prevented the escape of shipwrecked persons, or hung out false lights to bring any ship or vessel into danger.

The laws relating to wrecks of ships and goods, and the preservation of life and property, or the prevention as far as possible of such catastrophes and casualties, were formerly contained in a multitude of Acts scattered through various reigns. These underwent very careful revision and codification in 1854, when the Merchant Shipping Act was passed. The eighth section relates to "wrecks, casualties, and salvage," and authorizes the Board of Trade to institute inquiries in cases of wreck and casualty, and prescribes the machinery by which these investigations are to be carried on. Of course, if the accident is attributable to the carelessness, or incompetency, or misconduct of the master or mate of the ship, all that can be done by way of prevention for the future is to punish the offender by depriving him of his certificate of competency, without which he cannot again be employed in the same capacity, or by suspending the certificate for such a period of time as may appear adequate to the offence. But when the accident arises from some impediment not noted in the charts, &c., the remedy is provided by the sixth part of the Act. Now, as formerly, the sovereign, or lord of a manor to whom a grant of wreck has been made, is the ultimate owner of lost property; and if, after being in custody of the receiver of wrecks for a year and a day, the shipwrecked goods are not claimed, the proceeds of the sale, less the amount of the salvage, are paid to the crown or to the lord of a manor, as the case may be. The importance of the authorized investigations by the Board of Trade cannot be too highly estimated, when it is considered that the average number of wrecks and casualties on the coasts of the United Kingdom and surrounding seas during the ten years ending 1871 amounted to 1708, while for the four following years ending 1875 the average number was 1876. In the twenty years ending 1875, no less than 31,500 vessels were wrecked around our coasts, being 10,000 more than the total number upon the British Register. The financial loss was more than £10,000,000, while the loss of human lives amounted in number to 14,460. Under such lamentable circumstances it was impossible not to sympathize with the noble endeavours of Mr. Plimssoll, M.P., to protect the lives of our seamen by insisting upon a rigorous inquiry into the competency of masters and the condition of ships before they put to sea; and it is satisfactory to know that from 1877 to 1888 the number of lives lost was considerably less than in the ten preceding years, owing to the precautions adopted by the Board of Trade and to the extension of the Lifeboat Institution. [See under BOAT.] There is now upon our shores a very effective system of lights, buoys, and beacons, and with more efficient inspection of vessels, and a better knowledge of local currents, sandbanks, meteorology, signals, and corrected charts, a still further decrease in the annual wreck register may reasonably be looked for.

**WREN** is a name given to many small birds, as the wood-wren, the willow-wren, the reed-wren, &c.; but the true wrens form a genus, *Troglodytes*, the type of a family, Troglodytidae, which is nearly allied to the Warblers (Sylviidae). They are small birds, inhabiting the northern and temperate parts of the northern hemisphere. The bill is slender, slightly curved and pointed, with the margins of the mandibles unnotched; the wings are very short and rounded; the tail is short and carried erect; the legs are slender and rather long. The Common Wren (*Troglodytes parrulus*) is distributed over the whole of Europe, and extends into Central Asia. It is one of the smallest of British birds, scarcely exceeding 3½ inches in

length. The general colour of the plumage above is reddish-brown, barred transversely with blackish-brown; the outer wing feathers are barred with dark brown and dull white; there is a white line over the eye; the under surface is brownish-white.

This popular little favourite, which has become sacred, like the robin, from the confidence which it shows in courting the neighbourhood of man, creeps about the hedges, making small flights, and in its search for insects and worms generally entering the lower part of the hedge and working upwards. The song is loud, sweet, and sus-



The Common Wren (*Troglodytes parrulus*).

tained. Like the robin, it will sing cheerily even in mid-winter. The nest is large in proportion to the bird, and the shape is generally oval, the top being in the form of a dome, and the entrance by a small hole at the side. The materials of which it is composed vary according to the situation chosen for the structure. The nest is sometimes placed in a hole of a wall or a tree, sometimes in a crevice among stones, or under an overhanging bank, sometimes among the thatch of a building, sometimes in the branch of a tree, or hidden among the foliage of climbing plants, such as ivy and clematis. When it is built on the ground it is generally composed of leaves, twigs, and straws, and lined with hair and feathers; in other situations the exterior is generally composed of moss. It lays from seven to ten, and even more eggs, white, generally spotted and speckled with light red.

In severe winters wrens sometimes take shelter in their old nests, or in a sheltered hole under a wall, &c. Notwithstanding the general affection in this country for this little bird, as shown by its popular names Jenny Wren and Kitty Wren, a cruel custom of hunting it and killing it with sticks on St. Stephen's Day formerly prevailed in the south of Ireland, the Isle of Man, and Pembrokeshire.

Several species of wrens are common in North America. The House Wren (*Troglodytes ædon*) is common in the United States, where it is a great favourite for its familiarity, boldness, and pugnacity. It haunts gardens, and commonly builds about houses, often in boxes prepared for the reception of its nest. It is about 4½ inches long, and has a longer tail and a longer and more curved bill than the common wren; it is deep brown above, barred transversely with black; the throat and breast are light brown, and the belly is mottled with black, brown, and

white. The Marsh Wren (*Thryothorus palustris*) is a nearly allied North American species, frequenting the banks of rivers, and building a pensile nest among the reeds.

**WREN, SIR CHRISTOPHER**, born at East Knoyle, Wilts, 20th October, 1632, was the son of Dr. Christopher Wren, chaplain to Charles I., and dean of Windsor. He was entered at Wadham College, Oxford, in 1645, and soon distinguished himself in mathematics and natural philosophy. While at Oxford he associated with Hooke and other scientific men, whose meetings laid the foundation of the future Royal Society. In 1653 he was elected a Fellow of All Souls College, Oxford. In 1657 he was appointed to the professor's chair of astronomy at Gresham College, London, and three years after to that of Savilian professor at Oxford, when he resigned the former chair. On the establishment of the Royal Society he became a member. In 1661 he was appointed by Charles II. assistant to Sir John Denham, the surveyor-general, and was commissioned in 1663 to survey and report upon St. Paul's Cathedral, with a view to its restoration. Meantime, Wren had been employed on the Sheldonian Theatre at Oxford, and Trinity College, Cambridge. He visited Paris in 1665, where the works of the Louvre were then in progress. At the beginning of the following year he returned home, when the Great Fire of London opened an extensive field for his talents. He made a survey of the whole of the ruins, and proposed a plan for laying out the devastated space in a regular and commodious manner, with wide streets and squares, and a line of spacious quays along the Thames; but this idea, though a grand one, was totally disregarded by the property owners of London, and the new houses rose very much upon the lines of their predecessors. In 1672 Wren received the honour of knighthood; and in 1671 married a daughter of Sir John Coghill, after whose decease he took for his second wife a daughter of Viscount Fitzwilliam, an Irish peer; and by both these ladies he had issue.

During this time he had prepared various designs and models for the intended cathedral of St. Paul; but the one which he himself was most solicitous to see adopted, a design for an edifice in the form of a Greek cross, and of a single order in height, with a dome as large as that of St. Peter's, was set aside by the Duke of York, afterwards James II., with a view to the future introduction of the ceremonials of the Roman Catholic service, for that of the present structure. The first stone of the building was laid 21st June, 1675; the choir was opened for divine service in December, 1697, and the whole was completed in thirty-five years, the last stone on the summit of the lantern being laid by the architect's son, Christopher, in 1710. The interior decoration, according to Wren's designs, was never completed, but is now (1888) in progress. Besides St. Paul's he designed fifty-three churches in London, of which fifty were intended to replace those destroyed in the Great Fire. Among the more famous are St. Mary-le-Bow, St. Bride's in Fleet Street, St. Vedast in Foster Lane, St. Dunstan-in-the-East, and St. Stephen's in Wallbrook, the last-named being particularly noted for its exquisitely beautiful interior. His remaining works include the Royal Exchange and the Custom House, both subsequently burned; the Monument, Temple Bar, and the College of Physicians in London; the hospitals of Greenwich and Chelsea; large additions to the palaces of Hampton Court and St. James; the west front and towers of Westminster Abbey; a palace at Winchester for Charles II.; and the libraries of Trinity and All Souls.

Wren resigned the office of Savilian professor in 1673; he accepted that of president of the Royal Society in 1680, and he also sat several times in Parliament, but his numerous and important professional engagements left him little leisure for other pursuits and duties. On the

accession of George I. court influence was brought to bear against him, and at the age of eighty-six he was removed from the office of surveyor-general, which he had held for forty-nine years. The last five years of his life were spent in retirement. He was found dead in his chair after dinner on 25th February, 1723. He was buried in the crypt of St. Paul's, and a black marble slab over the north entrance, bearing the inscription, *Si monumentum queris circumspice* ("If you seek his monument, look around"), marks the place of his tomb. A collection of his original drawings is preserved in the All Souls Library at Oxford. The most authentic record of his life is to be found in the "Parentalia," begun by his son Christopher, and completed by his grandson Stephen Wren (1750). See also Elme's "Memoirs of the Life and Works of Wren" (London, 1823); "Sir Christopher Wren, his Family, and his Times," by Lucy Phillimore (London, 1882); and "The Towers and Steeples designed by Sir C. Wren," by A. W. Taylor (London, 1882).

**WREXHAM**, the largest town in the county of Denbigh, in North Wales, situated on a small stream which flows into the Dee, a few miles from the west bank of that river, 12 miles S.S.W. of Chester, and 179 N.W. from London by rail. Wrexham is situated in the mining district of the county, and is one of the most important towns in North Wales. It has some large ironworks and furnaces, manufactures of flannels, and rope yards and breweries, and in the vicinity some large paper-mills. The houses are in general well built; and the streets, which are wide and generally cross each other at right angles, are well paved. The church is a handsome and spacious Gothic building, built about 1470. There are another church, several dissenting chapels, a Roman Catholic church, guildhall, market hall, and a free library. The population in 1881 was 10,978. The municipal borough is governed by four aldermen and twelve councillors. In ancient times the town was part of Powisland, although the Mercians claimed it. Its ancient name was *Wrightesham*, and in the reign of Elizabeth it was called *Wricksham*.

**WRIGHT, JOSEPH**, known as "Wright of Derby," was the son of the town-clerk of that place, where he was born in 1731. He studied under Hudson, the master of Sir Joshua Reynolds, and set up as a portrait painter at Derby, achieving much success. He acquired his special reputation later on, by his candle or fire-light pieces. Wright visited Italy in 1773-75. In 1782 he was elected an associate of the Royal Academy, but finding one whom he considered his inferior elected to the full honours before him in 1784 he refused the R.A. when it was offered him, and retired from the Academy. He occasionally exhibited at the Academy, notwithstanding his separation from it. His name appears for the last time in 1790. He died in 1797. The National Gallery possesses his fine picture of the "Air-pump." An excellent and somewhat laudatory memoir of Wright appeared in 1886, by Mr. Beattie, a descendant of the painter.

**WRITER**, in Scotland, is a term of nearly the same meaning as solicitor in England, and is generally applied to all legal practitioners who do not belong to the bar of the supreme court. It has of late become customary to substitute for it the term solicitor. As special exceptions, the body who in Edinburgh enjoy, concurrently with writers to the signet and other law agents, the privilege of conducting cases before the Court of Session, the Court of Justiciary, &c., are called solicitors in the supreme courts (abbreviated S.S.C.), and the practitioners before the sheriff court of Aberdeen are by ancient custom called advocates. The practitioners or law agents in the sheriff courts (which answer to the county courts of England, but have far more extensive jurisdiction) are now regulated by the Law Agents Act, 1873 (36 & 37 Vict. c. 63), and Acts of Sederunt passed by the Court of Session.



**WRITER TO THE SIGNET**, abbreviated W.S., is the designation of the members of the most important class of law agents in Scotland. They enjoy, in common with the solicitors in the supreme courts and law agents under the Act of 1873, the privilege of conducting cases before the supreme courts. They had formerly exclusive privileges, but these are now nearly all abolished.

**WRITER'S CRAMP** or **SCRIVENER'S PALSY** is a disease of slow development and chronic form, in which the patient complains of inability to execute some common act, such as that of writing or playing on the piano, which has hitherto been accomplished without difficulty. There are many forms of this disease, and it has been noticed in connection with painters, engravers, violinists, piano players, tailors, needlewomen, &c., but all forms are rare compared with that which affects writers. In the general way the affection is first noticed after fatiguing work with the pen, when the sensation of weariness is accompanied by sharp pains running through the hand and up the arm. By degrees the symptoms become more marked, and make their appearance very soon after the commencement of the exertion, and ultimately the mere effort to put the hand in position will be sufficient to bring about pain and helplessness. As the disease progresses the sufferer often tries to mitigate it by holding the pen in a different position to the ordinary, but as a rule as soon as the new method is learned the muscles of the forearm become subject to the spasm, and he is no better off than before. The sensation of the affected parts is seldom impaired, and persons suffering from so severe a form of the disease as to be incapable of signing their names may yet be able to perform any other ordinary act without the slightest difficulty.

The treatment consists primarily in giving the affected muscles rest, and if sufficient rest be taken in the early stages of the disease complete recovery not unfrequently results in a month or two. When complete rest cannot be obtained the patient should write as little as possible, and should use a soft quill or a large cork penholder, so as to make the exertion as little as possible. In severe cases absolute cessation from writing must be insisted on for a long period, for in no other way can a cure be effected. A rhythmical exercise of the affected muscles, with the employment of a mild galvanic current, will often be of the greatest assistance in the treatment of this affection, and attention must also be paid to the general health.

**WRITING.** See the articles **ALPHABET** (with Plates), **AUTOGRAPH**, **HIEROGLYPHICS**, **LANGUAGE**, &c.

**WRY NECK** (*Iynx* or *Yunn*) is a genus of birds, forming a family Iynxidae, nearly allied to the Woodpeckers (*Picidae*), and placed with them in an order Pic. The wrynecks are natives of Europe, India, and North-eastern and Southern Africa, but are not found in America, where the woodpeckers are abundant. The tail is rather short and rounded, and not stiffened as in the latter family. The Common Wryneck (*Iynx torquilla*) is a summer visitor to Britain, arriving and departing at about the same periods of the year as the cuckoo, whence it is sometimes called the cuckoo's mate. It is widely distributed over Europe, breeding in the south, and extends its range to India. It is about 7 inches long, yellowish-gray above and white beneath, variously spotted, mottled, and banded with brown and black. It derives its common English name from its habit of twisting its head and neck quickly in various directions when feeding or when alarmed. The food of the wryneck consists principally of ants and their larvæ and pupæ. It also captures insects of various kinds by running upon the trunks and branches of trees, and darting out its long extensible tongue like the woodpeckers. It breeds in holes of trees, laying its eggs on the rotten wood at the bottom of the cavity. The eggs are sometimes nine or ten in number and of a

pure white colour. In the south of Europe the wryneck is esteemed for food in autumn, at which season it gets very fat.

**WUO'TAN.** See **WOTAN**.

**WURTEMBERG**, a kingdom situated in the south-west of Germany, inclosed by Bavaria and Baden, with the exception of a small strip of the southern boundary, which is formed by the Lake of Constance. Its greatest length from south to north is about 130 miles; its greatest breadth is 95 miles. The area is 7675 square miles, and the population in 1885 was 1,976,741. The two principalities of Hohenzollern belonging to Prussia are almost wholly surrounded by Württemberg.

*Surface, Climate, &c.*—The surface is generally mountainous, the lowest part being 420 feet above the sea; on the east the Swabian Alb or Alp enters the country, and the western border is covered by the northern Schwarzwald (Black Forest), both of which send out branches in all directions. The Schwarzwald, which runs from south to north, slopes gradually towards the centre of the kingdom. It consists chiefly of granite and sandstone, and is intersected by many well-watered valleys. The highest points of the northern Schwarzwald are the Hornsgrinde, 8640 feet, and the Rossbühl, 2943 feet high. The Döbel is the highest cultivated part. The Swabian Alp, which lies entirely in Württemberg (excepting a small portion in Hohenzollern), runs from south-west to north-east about 80 or 90 miles, with a mean breadth of about 14 miles, and forms part of the watershed between the Neckar and the Danube. On the north-west side it is steep, but on the south-east it gradually declines into undulating hills. Though not so elevated as the Schwarzwald, it is more bleak and barren, and contains several large subterranean caverns.

The principal valleys are those of the Neckar and the Danube. They are of an average height of 500 feet above the sea. The chief rivers are the Neckar and the Danube, into which almost all the others, which are invariably small, discharge themselves. The Lake of Constance is the only considerable one in the kingdom, but small lakes are numerous.

The climate is mild and healthy, with, of course, the variations which arise from differences of elevation. The winter is long on the summits of the Alp and the Schwarzwald, and it is there too cold to produce corn; but they are covered with forests, and pasturage is found in the summer.

*Soil, Products, &c.*—Württemberg is one of the most fruitful countries of Germany. Agriculture is on the whole conducted upon a good system, and more corn is raised than is required for local consumption. The chief agricultural products are wheat, maize, oats, barley, rye, wheat, pease, beans, vetches, potatoes, flax, hemp, rapeseed, poppies, hops, and tobacco. Cherries, damsons, walnuts, peaches, apricots, and the more common fruits and vegetables, are raised very extensively, and a good deal of cider is made. In the circle of the Neckar figs and melons ripen in the open air. The vine is also cultivated. Rich pastures, cultivated fields, orchards, gardens, hills covered with vines, and mountains with forests, afford the most diversified scenery.

*Natural and Industrial Resources.*—The metals and minerals are cobalt, silver, copper, lead, zinc, iron, marble, millstone-grit, freestone, quartz, precious stones, porcelain earth, potter's clay, fuller's earth, chalk, salt, and a little coal. Native sulphate of lime is worked, and there are mineral springs at Cannstadt and Stuttgart. The salt works are the property of the government, which has the monopoly of the trade. There are extensive peat lands, the produce of which is used for fuel; and from them a large revenue is obtained. Some quarries of excellent building stone are also worked in the country.

The industrial products include sugar from beet, linen



and woollen cloths, calicoes, silks, lace, hosiery, muslin, carpets, leather, paper, porcelain, earthenware, iron and steel ware, arms, gold and silver plate, musical instruments, tobacco, tobacco-pipes, and gunpowder; there are likewise numerous printing establishments, distilleries and breweries, and chemical factories. The manufacture of wooden clocks and toys, which are exported to all parts of Europe and America, is extensively carried on in the Black Forest and other places. Württemberg has a very considerable trade in its natural productions and manufactures, its horned cattle, horses, sheep, timber, wool, and printed books. The imports consist of raw cotton, silks, glass wares, wine, fruit, cheese, china, earthenware, and all kinds of colonial produce. There is likewise a very great transit trade. The inland navigation is important, especially on the Neckar, which becomes navigable at Cannstadt, and many steamers are also employed on the Lake of Constance. Railways connect all the chief towns, and communicate with the more important continental systems. The whole of the lines within the kingdom belong to the state.

Württemberg is divided into the four *kreise* or circles of Neckar, Black Forest, Danube, and Jaxt. The chief town is Stuttgart.

*Revenue.*—The revenue and expenditure of the kingdom are each about £2,700,000 per annum, and there is a public debt of £21,000,000, which was chiefly incurred in the construction of railways. Owing to the configuration of the country the construction of the lines was costly.

On its incorporation into the German Empire in 1871, the Prussian military system was adopted, under which every male above twenty-one years of age is liable to service, and no substitution is allowed. Württemberg also accepted a federal commander-in-chief, but retained the command of her troops in time of peace. The troops have to swear fidelity to their own sovereign as well as to the emperor. Württemberg furnished 7,640,000 marks to the imperial expenditure in 1887.

*Government, Social Condition, &c.*—The constitution bears date 25th September, 1819. It provides for absolute freedom of person and property, liberty of conscience and speech, and limited liberty of the press. All citizens are equal before the law, and no privileges and no monopolies of rank and birth are allowed to exist. In the king rests the sole executive power, but it has to be exercised through ministers responsible to the country. The legislative power is given jointly to the king and the representatives of the people, and the consent of both parties is requisite to give decrees of either the head of State or the Chambers the force of law. The Parliament, or Landtag, consists of two Houses, called together every three years, or oftener if necessary. The Upper Chamber, or House of *Standesherren*, is composed of the members of the royal family, the heads of the principal noble families of the country, the representatives of certain territories and estates formerly possessing a vote in the German Diet, and a number of members nominated by the king for life. The latter, however, must not exceed one-third of the whole House. The second Chamber, or House of Deputies—*Abgeordnete*—consists of thirteen members of the nobility, elected by the Ritterschaft or noblesse of the kingdom, six superintendents of the Protestant church, six deputies of the Roman Catholic clergy, the chancellor of the University of Tübingen, and seventy deputies of towns and rural districts. All the members of the second Chamber are chosen for six years, and they must be thirty years of age; a property qualification is not necessary. To be a member of the first Chamber it is sufficient to be of age. The president of both Houses is appointed by the king; for the Upper House without restriction, and for the Lower from among three members elected by the deputies. The debates of the second chamber are public, and have to be printed and distributed among the various constituencies. Whenever

Parliament is not sitting, it is represented by a committee of twelve persons, consisting of the presidents of both Chambers, two members of the Upper, and eight of the Lower House. A special court of justice, called the *Staats-Gerichtshof*, is appointed guardian of the constitution, as well as of rights and privileges of the Houses of Parliament. It is composed of a president and twelve members, six of whom, together with the president, are nominated by the king, while the other six are elected by the combined Chambers. The executive of the kingdom consists of six ministerial departments, presided over by the king, or a member of the royal family nominated by his Majesty.

The last census states the religious creed of the inhabitants as follows:—Evangelical Protestants, 1,364,580; Roman Catholics, 590,290; dissenters of various denominations, 2,917; and Jews, 13,331. The Evangelical Protestant Church of Württemberg was formed in 1823, by a union of the Lutherans and the Calvinists or Reformers. The administration of its affairs is in the hands of six general superintendents, at Ulm, Ludwigsburg, Reutlingen, Hall, Heilbronn, and Tübingen. In the king is vested, according to the constitution, the supreme direction as well as the guardianship of the church, which is considered, though not formally declared, the religion of the state. The Roman Catholics are under a bishop, who has his seat at Rottenburg, but who in all important matters has to act in conjunction with a Catholic Church council, *Kirchenrath*, appointed by the government. The Jews likewise are under a special board, nominated by the minister of ecclesiastical affairs.

Education stands very high in Württemberg. Every child between seven and fourteen must attend school, and it was officially ascertained that even so long since as 1810 there was not an individual in the kingdom, above the age of ten, unable to read and write. The people of Württemberg use in familiar conversation a *patois* highly offensive to the cultivated German, called Swabian. In different localities this *patois* is more striking than in others, in some being almost unintelligible. The whole educational system is centred in the University of Tübingen, founded in 1477.

*History.*—Württemberg is composed of a number of separate territories, which once belonged to the Alemanni and Franks, and afterwards formed various independencies. The first inhabitants, said to have been Celtic, were gradually encroached upon by the Germans, and finally, with them, fell under the Roman yoke. After the decline and fall of the Roman Empire, the country was incorporated with the kingdom of the Franks, who governed it by dukes. The dukedom thus established existed till the end of the eleventh century, when it was broken up, and partitioned among counts, who declared themselves independent. Among these was the Count of Beutelsbach-Württemberg, whose family gradually gained the ascendant. One of its members built a castle at Stuttgart, and another the castle of Württemberg, which has given its name to the whole kingdom. In this line, towards the end of the fifteenth century, the dukedom was restored. The Thirty Years' War was often very disastrous to the inhabitants. During the French Revolution the country became the theatre of war, and was overrun by the French armies. Ultimately, however, the duke gained the favour of Napoleon, and with it a great accession of territory, as well as the title of king. In the subsequent arrangement of the European states, the territorial accessions were confirmed, and the title of king formally recognized. In 1849–50 national assemblies were convoked to revise the constitution of 1819, but in consequence of their democratic leaning they were dissolved. Until 1866 Württemberg held the sixth place in the Germanic Confederation. It afterwards held the second place in the South German Confederation, but entered heartily into the war with France in 1870–71,

on the side of Prussia, and now forms part of the united German Empire.

**WURZBURG**, a town, and the capital of the Bavarian circle of Lower Franconia, situated in a beautiful valley on both sides of the Main, over which there is a bridge 200 yards long, adorned with twelve colossal statues of saints. A bishop's see was erected here in 741, and the bishops gradually acquired a large territory, which formed the episcopal principality of Würzburg. It was secularized and given to the Archduke Ferdinand, of Austria, in 1803, but was ceded to Bavaria in 1815. The town possesses many handsome buildings. The principal churches are—the cathedral, built in the eighth century, which contains several fine paintings and a long series of monuments of the bishops, each bearing the sword in one hand and the crozier in the other; the Church of St. John-in-Haag, built on the model of St. Peter's at Rome; the New Minister, containing the relics of St. Kilian, an Irish missionary, one of the earliest preachers of the gospel in Germany; St. Mary's, an elegant edifice, in the German pointed style, with lofty lancet windows; and the University church, with the observatory on its lofty tower. The most remarkable of the other buildings are—the splendid episcopal palace, called also the royal residence, built on the plan of the palace at Versailles, has fine gardens, and is, altogether, considered one of the most handsome royal abodes in the world; the Julian Hospital, a very large, wealthy, and admirably-arranged institution; the town hall, and the university, to which are attached a clinical establishment, an anatomical museum, a collection of instruments, a library of 100,000 volumes, a cabinet of works of art, &c. The university, as well as the hospital, was founded by Bishop Julius in the sixteenth century, the endowments for both having been taken from the possessions of the convents destroyed during the Peasant War. The former has always been celebrated for its medical school. There is a fine statue to the bishop in front of the hospital. The educational, charitable, and useful institutions are very numerous. The streets near the palace square are wide and straight, but most of the others are narrow and crooked. In the smaller division of the city, on the left bank of the Main, is a steep hill or rock, called also the Frauenberg or Marienberg, about 400 feet high, on which the citadel stands, but it has no military strength. The view from this summit is very fine. There are, in the immediate vicinity of the city, 7000 acres of vineyards, and many large gardens. The population of Würzburg in 1880 was 51,014. The inhabitants manufacture woollen cloth, mirror glass, tobacco, leather, hats, railway carriages, surgical instruments, cutlery, paper, sugar, and beer; there is a considerable export trade in corn, fruits, and wine. The town possesses admirable railway facilities for reaching nearly all parts of the Continent.

**WYATT, SIR THOMAS** (more usually spelt *Wyat* by the poet's contemporaries), a poet of great mark, as well as statesman and diplomatist, was born in 1503 at Allington, Kent. He studied at St. John's College, Cambridge. At the coronation of Anne Boleyn he officiated as chanter to his father, who was treasurer of the king's chamber. He appears subsequently to have incurred the king's suspicion of engaging in an amatory intrigue with Queen Anne. This cloud passed away, and in 1536 he was knighted. He then suffered imprisonment in the Tower on account of a quarrel with the Duke of Suffolk. Soon after his release he was made sheriff of Kent. His diplomatic career began in 1537, when he was sent to Spain as ambassador to the Emperor Charles V., whom he attended from Paris to Brussels on a subsequent occasion. His observations in Spain and in Germany were of great service to his government, and it was only with difficulty he obtained leave to return home in 1539. Then followed his second mission to Charles V. On the fall of Cromwell

he lost a powerful friend, and was exposed to the machinations of Bonner, who procured his arrest in 1541 on a charge of holding treasonable correspondence with Cardinal Pole. His noble defence on the trial which followed is printed with his sonnets. He was acquitted, and received fresh favours from the king. In retirement at Allington he occupied himself with writing ballads, sonnets, and satires, which, with those of Lord Surrey, were the first-fruits of modern English poetry. The high honour of introducing the sonnet into English literature is solely due to Wyatt, and that of the introduction of blank verse to Surrey. Wyatt is exceedingly original and forcible, sometimes a little far-fetched, but eminently readable and most interesting. His letters to his son are excellent literary compositions. Ambassadors from the emperor reached England in 1542, and Wyatt was ordered by the king to meet them at Falmouth. The difficulties of travelling were then very great. Wyatt's anxiety and haste brought on a violent fever, which proved fatal. After lingering a few days at Sherborne in Dorsetshire, he died on the 10th or 11th of October, 1542.

**WYCHERLEY, WILLIAM**, an English dramatist, was born in 1640, and was the eldest son of Daniel Wycherley of Cleve, in Shropshire, the representative of an old family, and possessed of a good estate. From an early age he had been in the habit of writing verses, and having turned his attention to dramatic compositions on leaving college, he published "Love in a Wood" in 1672; the "Gentleman Dancing Master" in 1673; the "Country Wife" in 1675; and the "Plain Dealer" in 1677. It is probable, however, that these plays were composed some time before. They have many merits, but unfortunately are so licentious as to be almost unreadable. "They are our first, and by no means our worst, specimens of the comedy of manners. After the production of his first play he became one of the favourites of the abandoned Duchess of Cleveland, by whom he was introduced at court, where he attracted the attention of the king, who was pleased with his conversation and manners. As his health was shattered Charles gave him £500 to defray the expense of a journey to the south of France to restore him. After the publication of his immoral but well-written play, the "Plain Dealer," Wycherley was selected by the king to conduct the education of his natural son, the Duke of Richmond, with a salary of £1500 a year. But before entering on the duties of his office he went to amuse himself at Tunbridge Wells, where he was accidentally introduced to the Countess of Drogheda, a gay and rich young widow. They married secretly, much to the displeasure of the king, and the royal favour was in consequence completely withdrawn from the poet. To complete his misfortunes his wife proved ill-tempered, imperious, and so extravagantly jealous that when Wycherley met his friends, which she occasionally allowed him to do, in the Cock tavern opposite to his own house, he was obliged to have the windows always open, in order that her ladyship might be satisfied that no woman was of the party. Her death, which took place soon after, released him from this bondage, but a series of disasters fell upon him in rapid succession. His wife bequeathed her fortune to him, but the will was disputed; the expense of the lawsuit, and probably his own extravagance, involved him in debt, and he was at last thrown into the Fleet, where he languished during seven years, apparently quite forgotten by his gay associates. At length James II., who now filled the throne, happened to witness the performance of the "Plain Dealer," and was so delighted with the play, that having learned the distressed condition of the writer, he released him and settled on him a pension of £200 a year. Wycherley's reconversion to the Church of Rome, to which he had belonged in his youth when he was in France, probably took place at this time, and may not have been altogether unconnected with the king's unwonted

munificence. Shortly after his release from prison he succeeded, on the death of his father, to the family estate, but it was strictly entailed, and his extravagant and vicious habits involved him in continual embarrassments. In 1704, after twenty-seven years of silence, he published a large folio volume of miscellaneous and utterly worthless poetry. At this period he formed an acquaintance with Pope, who was then only sixteen. Wycherley availed himself of the assistance of the youthful poet to retouch and polish his "feeble stumbling verses," but became at length so sore under Pope's criticisms that a marked coldness ensued, and the unnatural friendship was dissolved. The aged dramatist continued to the last to indulge in the follies and vices of youth. He survived to the age of seventy-five, and ten days before his death, which took place in December, 1715, he married a young girl merely to injure his nephew and heir-at-law.

**WYCH-HAZEL, or WITCH-HAZEL** (*Hamamelis*), is a genus of plants belonging to the order *HAMAMELIDACEÆ*. There are two species, one of which is a native of North America, and the other of Japan. They are shrubs or low trees, with simple alternate deciduous leaves and clusters of yellow flowers. The Common or Virginian Wych-hazel (*Hamamelis virginica*) is a native of North America from Canada to Louisiana, where it attains a height of from 10 to 20 and sometimes 30 feet. It is very remarkable from the fact that its flowers appear after its leaves have dropped off. Late in autumn and in winter, when most other plants have lost their flowers and foliage, the wych-hazel is covered with a profusion of yellow blossoms, which do not disappear till the commencement of spring. The leaves and bark are astringent and are used medicinally by the natives; the seeds contain a quantity of oil, and are eaten. It was introduced into this country in 1736, and grows readily in a light free soil.

**WYCLIF, WYCLIFFE, or WICLIF, JOHN DE**, an illustrious English reformer, was born probably in the village of Spresswall, about half a mile from the manor house of the family to which he belonged, and not far from Old Richmond in Yorkshire. The date of his birth is uncertain, but it must be assigned to the period 1315-24, most authorities pronouncing for the latter year. Nothing is known concerning his childhood or youth, but it is known that he passed through the full course of Oxford education, spending four years in the study of the arts, and five years more in the school of theology, which included the reading of the Canon Law. The details of his career at Oxford are wanting until 1356, when he is found seneschal of Merton College, and in a controversy with the Mendicant orders about 1360, he upheld the authority of the parochial clergy against the friars. In 1361 he was master or warden of Balliol, and the same year he was preferred to the living of Fillingham in Lincoln. The university, however, continued to be the chief seat of his activity, and in 1365 he became warden of Canterbury Hall by the appointment of Simon Islip, archbishop of Canterbury, under a new arrangement by which monks were excluded from it. The monks protested, its founder Islip died, and his successor pronounced Wyclif's appointment void. He in turn protested, but after some years of litigation the Pope decided against him in 1370, and the papal decree was confirmed by the king in 1372. Meantime he had become a doctor of theology, and one of the royal chaplains, and when Pope Urban V. demanded the annual tribute promised by John as an acknowledgment of the pontiff's feudal supremacy, Wyclif stoutly resisted the papal claim. In 1374 he was one of an embassy sent by Edward III. to negotiate at Bruges with the delegates of Gregory XI., chiefly concerning the papal reservation of benefices in England, which, being held by foreigners, diverted vast sums of

money to Avignon or Rome. As the popes at this time were the creatures of the French court, the money went to enrich the enemies of England, and the system supported by the Pope left parishes destitute of priests, while it trampled on the rights of patrons at the same time. Wyclif was therefore a champion of national independence in the resistance he offered to the papacy, and the king rewarded his services by presenting him to the prebend of Aust, in the collegiate church of Westbury, and to the rectory of Lutterworth in Leicestershire. The part which he took in the embassy made him obnoxious to the Pope, who in 1377 sent letters to Oxford and Canterbury, to the Bishop of London and the king, demanding inquiry concerning the doctrines imputed to him, and that he should be immediately put in custody until further instructions. Wyclif had already been summoned on a charge of heresy before the English convocation in St. Paul's, 19th February. When he made his appearance, however, it was with John of Gaunt, duke of Lancaster, on one side, and Lord Percy, earl marshal of England, on the other. Between these noblemen and Courtney, bishop of London, the presiding churchman, a violent altercation at once ensued; the throng broke into tumult, the meeting was dissolved, and the reformer withdrew under the protection of his powerful friends. The citizens of London, however, were incensed at the insults offered to their bishop, and they attacked the magnificent palace of John of Gaunt, the Savoy, which was saved by the interposition of Courtney. The papal bull was received by the universities with cold respect, but early in 1378 Wyclif appeared before a synod of the clergy in Lambeth, in obedience to a summons of the Archbishop of Canterbury. This time the sturdy London citizens were on the side of the reformer, and a messenger also arrived prohibiting the synod in the name of the queen-mother, the Princess Joanna, from proceeding to any conclusion injurious to him. He was released with an admonition, and at once resumed his pulpit discourses, academic lectures, and the publication of his controversial tracts, his opinions becoming more and more adverse to those upheld by the majority of the clergy. In 1378 the contest between Urban VI. and Clement VII. for the papal chair produced a schism in the church, and when each claimant condemned his rival as antipope, Wyclif declared they were both right, both popes were alike "monstra," and the papacy itself was antichrist. The public sentiment in England, however, was in favour of Urban and against Clement, the latter being the nominee of France, and Wyclif's disagreement with the popular feeling seems to have brought his public career to an end.

He continued, however, to labour for the reformation of the church with unabated energy, and his disciples, under the name of poor priests, disseminated his doctrines by means of open-air preaching and the circulation of written copies of his works. In 1381 he took his boldest step, and that which gave the greatest offence, by lecturing at Oxford against the doctrine of transubstantiation. The ecclesiastical authorities were greatly moved by this, and in 1382 he was summoned before the Convocation of the clergy at Oxford. He appeared and delivered two defences, one in English and one in Latin, but though no sentence was pronounced, a letter was obtained from the king which debarred him from teaching in the university. He spent his later years at Lutterworth, where he continued to preach and write unmolested, until his death, which took place on Sylvester's day, 31st December, 1384.

The Council of Constance, however, in 1418, after condemning forty-five articles taken from his writings, ordered his bones to be taken from consecrated ground and cast upon a dunghill. But the sentence remained unexecuted until 1428, when, by the orders of Clement VIII., his remains were exhumed, publicly burned, and the ashes cast into the Swift, a branch of the Avon.

As a philosopher Wyclif elaborated a system that was independent and eclectic, and which, from its subtlety and breadth, proves him to be no unworthy successor of the line of great English schoolmen—of Duns Scotus, William of Occam, and Thomas of Bradwardine. In his public life he offered a determined resistance to the encroachments of the papacy. In his treatise, "*De Dominio Divino*," he strikes at the feudalization of the church by pointing out that the spiritual office is a *ministerium*, not a *dominium*, and by declaring that the civil power in the state must be supreme. He was also opposed to the whole framework of the hierarchy as a device of clerical ambition, and to episcopacy and endowments, holding that the clergy should be satisfied with the necessities of life, and should be supported by the gifts of the faithful. He retained the ordinance of baptism, but without regarding it as essential to salvation, and the sacrament of the mass, in which he maintained the doctrine of the real presence, while denying transubstantiation.

He denied there was any intrinsic beneficial influence from confirmation, penance, holy orders, or extreme unction, and he taught that men are neither the better nor worse for church censures, the destination of each being determined according to his own spiritual condition as a responsible creature. He was a man of great industry, and according to Dr. Shirley, his Latin works are ninety-six in number and his English sixty-five. The latter, of which Thomas Arnold recognizes only forty-one as genuine, are for the most part short tracts, but among the former there are twelve or thirteen large treatises. His greatest work, however, was an English version of the whole Bible, translated from the Latin Vulgate, which he carried out in conjunction with Nicholas Hereford, and which was afterwards revised, partly by Wyclif himself, and partly after his death by John Parvey. The earlier version was finished in or about 1382, and the later version about 1388. Of this great work we give two short specimens, the first from the earlier and the second from the later version, which the reader may compare with that quoted from TYNDALE's version in the article on the subject:—

"Jesus seide to hem eft soone, Treuly, treuly, I seie to you, for I am the dore of sheep; alle hou many ever camen ben nyght theefes and day theefes, but the sheep herden not hem. I am the dore. If any man shal entre bi me, he shal be saved, and he shal go in and shal go out, and he shal fynde lewes [pasture]. A nyght theef cometh not but that he stelo and slec and lesece. I cam that thei have lif and have more plencously. Y am a good shepheard. A good shepheard giveth his soule, that is lif, for his sheep. Forsothe a marchaunt, or hylrid hinc, and that is not a shepheard, whos ben not the sheep his owne, seeth a wolf comynge, and he leeveth the sheep and fleeth, and the wolf ravyschith and disparilith, or scateith, the sheep."

"I am a verrey vyne, and my fadir is an erthe tiller. Ech branche in me that berith not fruyt he shal take away it, and ech that berith fruyt he shal purge it that it bere the more fruyt. Now ye ben cleue for the word that I have spokun to you. Dwelle ye in me and I in you. As a branche may not make fruyt of it self, but it dwellith in the vyne, so neither ye, but ye dwelle in me. I am a vyne, ye the branchis. Who that dwellith in me and I in him, this berith mych fruyt; for withoute me ye moun nothing do."

The works of Wyclif after remaining for the most part in MSS. for 500 years, are now in course of complete publication by the Wyclif Society, formed in 1882. The "*Select English Works of John Wyclif*" have been edited from original manuscripts by Thomas Arnold (three vols., 8vo, London, 1871). Of Wyclif's translation of the Scriptures, the first edition was printed by Lewis (London, 1731). The best edition is that of Fershall and Madden (four vols., Oxford, 1850). See also the Rev. Dr. Shirley's "*Fasciculi Zizaniorum Magistri Johannis Wyclif*" (published 1858 by the Master of the Rolls), and the lives of Wyclif by Lewis (Oxford, 1820), Tytler (Edinburgh, 1826), and Professor Lechler of the University of Leipzig (Leipzig, 1878, English translation, with additional notes by Pro-

fessor Lorimer, London, 1878), Vaughan (London, 1828 and 1853). In the last-mentioned work Professor Lechler traces out the intimate connection which existed between Wyclif and the Hussite movement, and shows that Huss made free and copious use of the writings of Wyclif.

**WY'COMBE, CHIPPING or HIGH**, a municipal borough and market-town of England, in Buckinghamshire, 29 miles W.N.W. from London by road, and 34 by the Great Western Railway. It is situated in a valley under the Chiltern beechwoods, near the river Wye, or Wycombe, which is lined with several paper and corn mills, and joins the Thames at Wooburn. The town, consisting chiefly of one long street, is clean and well built. The principal structures are All Saints Church, of the thirteenth century, in the Norman style, with a tower 100 feet high; two other churches, several chapels, town-hall, grammar-school, free library, and hospital. The parish church, which is said to be the finest as well as the largest in Buckinghamshire, underwent extensive restoration in 1875-76. Some business is done in malt and corn, but the staple manufacture of the borough, which has sprung up within the last thirty years, is that of chair-making, from beech, elm, birch, and cherry trees. By a suitable division of labour orders are very speedily executed for thousands at a time for any part of the world. The municipal borough is governed by a mayor, six aldermen, and eighteen councillors, and had a population in 1881 of 10,618. Formerly two members were returned from Wycombe, but it was deprived of one by the Reform Act of 1867, and under the Redistribution Act of 1885 it ceased to have separate representation.

**WYE.** See SEVERN AND WYE.

**WYKEHAM, WILLIAM OF**, an illustrious English statesman and prelate, was born at Wykeham or Wickham in Hampshire, in 1324, of poor but respectable parentage, his patronymic, if such indeed he had, being Longe. He was educated at Winchester High School through the liberality of Nicolas Uvedale, lord of the manor of Wykeham and constable of Winchester Castle, whom he afterwards served as secretary. By Uvedale he was recommended to Edyngton, bishop of Winchester, who took him into his service, and by the influence of both these patrons he was introduced to the knowledge of Edward III. about the year 1348. The earliest office held by him under the king of which we have documentary evidence, was that of clerk of the royal works on the manors of Heale and Yethamsted, the patent of which is dated 10th May, 1356. In the same year he was made surveyor of the king's works at Windsor, the castle there being for the most part rebuilt under his direction. His desire for fame, however, caused him to put in a conspicuous place in the castle the legend, "*Thys made Wykeham*," a circumstance which aroused the anger of the king, until the architect explained that what he meant was that the undertaking was the making of *him*. Meanwhile he had taken deacon's orders, and before he was ordained priest, in 1362, he was already the holder, by the king's favour, of several preferments in the church. Rising rapidly in the king's esteem and confidence, on the 11th of May, 1364, he was made keeper of the privy seal, and soon after he is found styled the king's secretary, or what we should now call principal secretary of state. In 1365 he was charged with three others to negotiate the ransom of David II., and in 1366 he succeeded his friend Edyngton in the see of Winchester. In 1367 he was appointed by the king Lord High Chancellor of England, and this office he continued to hold till 14th March, 1371. His position at this time is referred to by Froissart, who says: "*In those days there reigned in England a priest called William of Wykeham, who was so much in favour with the king that everything was done by him, and nothing was done without him.*" A few years after his retirement charges were made against him of

misappropriations of public money and oppressions, and in 1376 he was tried by a commission of peers, bishops, and privy councillors, and heavily fined. The fine, however, was remitted on the accession of Richard II. in 1377, and in 1389 he was a second time made Lord High Chancellor. He retained the office until 1391, when he succeeded for a time in reconciling the young king and the ambitious Duke of Gloucester. He died at South Waltham on 27th September, 1404, and was buried in his cathedral, the nave of which he was then rebuilding.

As a bishop Wykeham was distinguished by great vigour in reforming abuses and by splendid liberality in the execution of public ecclesiastical works and the creation of new educational foundations. He reformed the religious houses of all sorts existing in his extensive diocese, and he repaired, at a cost of 20,000 marks, all the castles or palaces—no fewer than twelve in number—then belonging to the see of Winchester. He also rebuilt the greater part of his cathedral in a style of great elegance and grandeur, but the great work of his life was the foundation of the two great colleges of New College and Winchester. The preparatory college or School of Winchester was opened in 1373, but the building was not finished till 1393. New College, Oxford, for which the other was intended to be a nursery, was begun in 1380, and finished in 1386, but the teaching was commenced in the same year as at Winchester. These magnificent foundations still flourish in undiminished lustre and usefulness, the noblest monuments of the founder's renown as a public benefactor, and admirable examples of the purity of his taste and the grandeur of his conceptions as an architect.

See the "Life of William of Wykeham," by Bishop Lowth, an illustrious alumnus of Winchester School and New College (new edition, Oxford, 1777), and Walcott's "William of Wykeham and his Colleges" (London, 1852).

**WYNANTS, JAN**, the first of the able Dutch landscape painters, was born at Haarlem about 1610. He has the credit of having been the master of his fellow-townsmen, Philip Wouwerman, who occasionally inserted the figures in the landscapes of his master. Wynants

died about 1680. His pictures are carefully painted. The National Gallery has five excellent works of his.

**WYOMING**, a territory of the United States, having Montana on the N., Utah and Colorado S., Dakota and Nebraska E., Idaho and Utah W. It has the form of a parallelogram, and is comprised within the highest region in the States, the mean elevation of the territory being 6400 feet, and the lowest upwards of 3000 feet above the sea. The surface is in general mountainous, with high level plains. The Rocky Mountains traverse the country from north-west to south-east, in which Fremont's Peak, in the Wind River range, attains an altitude of 13,570 feet, 1100 feet of which are above the limit of perpetual snow. Wyoming is chiefly included within the Mississippi-Missouri basin, drained by the Platte, Cheyenne, and Yellowstone rivers and their numerous tributaries, nearly all of them having their sources within the territory; while on the west side of the Rocky Mountains are the head-waters of the Green and Snake rivers, the former flowing south to the Colorado, the latter a main affluent of the Columbia. The climate, owing to its elevation, is cold; grain does not ripen, but the grass is always fresh and suitable to the rearing of sheep; wool is the chief product. The lower regions are covered with extensive forests, of which only a very small portion has been cleared. There are extensive deposits of tertiary coal; iron ore and gold have also been discovered, and the mineral riches are rapidly being developed. Mineral springs are abundant. The greater part of the **YELLOWSTONE NATIONAL PARK** occupies the extreme north-west corner of the territory; and the Union Pacific Railway passes along the entire southern border. It is the most sparsely peopled of any portion of the states. The capital is Cheyenne, on a tributary of the Platte. The area is 97,575 square miles, and the population in 1880 was 20,789.

**WYOMING**, a beautiful valley of Pennsylvania, United States, traversed by the Susquehanna, immortalized by Campbell's poem, which, however, is very inaccurate. The alluvial plains which border the river are remarkably rich and productive, and are underlaid by thick layers of anthracite coal.

## X

**X** to an Englishman is the representative of what might as well be denoted by the two consonants *ks* or *gs*. But in the Greek alphabet it was merely a guttural aspirate, equivalent probably to the German *ch*. The letter *X* was the last in the Roman alphabet, neither *Y* nor *Z* belonging to it. The words in which those two letters occur are not really part of the Latin language, but borrowed from the Greek, as *zephyrus*, *zona*; or from some Eastern source, as *gaza*. Such forms as *luchryma*, *hyema*, *sylen*, are errors of modern editors. The Romans themselves wrote *lacrima* or *lacrima*, *hiema* or rather *hiemps*, and *silva*.

In algebra *x* is the usual symbol for the unknown quantity which is to be determined.

It is customary to distinguish degrees of strength in beer and porter by *X*, *XX*, or *XXX*, which arose from the practice of marking a cask which was strong enough to be liable to 10*s*. duty with an *X*. The double and treble *X* would by supposition denote further increase of strength.

The interchanges of *x* with other letters are as follows:—

1. *x* with *c* or *k*, as in the double form of the Latin or Greek preposition *ex* or *ek* (*ec*).

2. *x* with *sc* or *sk*, as *hoax* (Old English, *husc*).

3. *x* with *g*, as in the Latin *augeo* compared with the Greek *auxano*; and Greek *migi-mami* compared with *miz*, English, and *miz-tus*, Latin.

4. *x* with *ps*, as the Latin *exilis* compared with the Greek *psilos*. Thus, too, *proximus* is the superlative of *prope*. This change is another instance of the interchange of *p* and *c*, so common between Greek and Latin.

5. *x* with *z*. In Spanish a *z* is found where the Latin has an *x*. Thus, the Latin words *crux*, *pax*, have become in Spanish *crúz*, *paz*.

**XANTHINE** or **XANTHIC OXIDE**, a substance first discovered by Marcet in a urinary calculus. It has since been found in the urine, the spleen, and the liver when in a state of disease, and it is also a constituent of the flesh of the ox, horse, and of some fishes, also of some kinds of guano. It can be prepared artificially from uric acid by the action of sodium amalgam, and from guanine by the action of nitrous acid. Xanthine is obtained in small white scales, having the formula  $C_5H_4N_4O_2$ . It is insoluble in cold water, only slightly soluble in boiling water, and insoluble also in alcohol and ether. It combines both with acids and bases, and the compounds are crystalline and soluble. With hydrochloric acid it forms a crystalline hydrochlorate ( $C_5H_4N_4O_2.HCl$ ). With the alkaline earth baryta, on the other hand, it forms a xanthate, having the formula  $C_5H_4N_4O_2.BaH_2O_2$ . Dimethyl-xanthine,  $C_5H_2(CH_3)_2N_4O_2$ , is isomeric with the theobromine obtained from cocoa.

**XANTHININE**, an organic base obtained from thionurate of ammonium. It is a yellow powder, having the formula  $C_4H_3N_3O_6$ , and is very slightly soluble in water; the solution has a light blue colour, and is fluorescent. It combines with acids, forming crystalline salts.

**XANTHIPPE** (or *Xantippé*) was the scolding wife of the great philosopher Sokrates, whose forbearance with her quarrelsome temper was a salient trait in his character. Although possibly, if we knew all the details, Xanthippe may have had much to sour her temper as the housewife of a philosopher, and, judging from other known examples, may not have been without excuse, she passes into history as the proverbial scold. Thus Petruchio:—

"Be she . . . as curst and shrewd  
As Sokrates' Xanthippe, or a worse,  
She moves me not."—"Taming of the Shrew," i. 2.

**XANTHOPHYLLITE**, a yellowish or grayish flaky mineral, met with in certain mines in the Ural Mountains. It is an impure silicate of magnesia, and is of great philosophical interest from the fact that microscopical crystals of the diamond have been discovered in it by a Russian chemist, Jeremiejew.

**XANTHORHAMNIN** is the yellow colouring matter obtained from Persian berries, the seeds of several species of Rhamnus, natural order Rhamnaceæ. It crystallizes in yellow scales, having the formula  $C_{27}H_{28}O_{14}$ , and is soluble in water and alcohol, but insoluble in ether. It dissolves in sulphuric acid, and on the addition of water is again thrown down as a yellow precipitate. It is a glucoside, and on boiling with dilute sulphuric acid it is converted into glucose and rhamnetin ( $C_{11}H_{10}O_6$ ). When alumina is used as a mordant it dyes fabrics yellow; when iron is employed it dyes black.

**XANTHORRHEA**. See JUNCACEÆ.

**XANTHOKYLON** is a genus of plants belonging to the order RUTACEÆ. The species are trees or shrubs with alternate compound leaves, and small unisexual flowers. They are natives chiefly of the tropics, but one American species extends to Canada, and several as far north as Japan in the Old World. They, to a greater or less extent, possess pungent and aromatic properties. *Xanthoxylon fistarinum* is the toothache-tree of North America, where it is found from Canada to Virginia. The bark and fruit have a hot acrid taste, and are used as a remedy for toothache; the bark is also used as a remedy in rheumatism. The fruits of some of the Indian and Japanese species are used as a substitute for pepper. The fruits of *Xanthoxylon hastile* are the Tej-bal of Northern India, and are used for intoxicating fish. Other species are used medicinally as febrifuges.

**XAVIER, ST. FRANCIS** (FRANCISCO DE XAVIER), a Spanish missionary, called the Apostle of the Indies, was the son of a Spanish nobleman, and was born at the castle of Xavier near Oñahos, in Navarre, probably in the year 1497, though a number of authorities give the year 1506. He graduated master in philosophy at the College of St. Barbe in Paris in 1530, and had gained some fame as a lecturer when a friendship formed with Ignatius Loyola turned his thoughts in another direction, and he became one of the first members of the Society of Jesus. He was ordained priest in Venice in 1537, and laboured among the poor at Bologna and Rome until March, 1540, when he was selected by Loyola as one of two missionaries requested by the King of Portugal for the Portuguese settlements in the East Indies. He travelled on foot to Lisbon, where he laboured with such self-denying zeal among all classes, that the king wished to keep him in the country, but finding him inflexible in his determination to go to the Indies, he procured his appointment as apostolic nuncio, and sent him on his journey invested with ample powers. On 6th May, 1542, he reached Goa, the capital of the Portuguese Indies, and at once commenced a series of missionary

labours which took him from Goa to Ceylon, Malacca, Celebes, and Japan, his ministry in the latter country lasting two years, and he was on his way to China when he fell sick of fever, and after being abandoned to his fate on the island of Sancian by the sailors, died 2nd December, 1552. During his ten years apostleship he is said to have planted the faith in fifty-two different kingdoms, preached the gospel through 9000 miles of territory, and to have admitted more than 1,000,000 persons to the church. His body was taken to Goa, and deposited in the church of the Ban Jesus, where it is said to remain without corruption, and once in a century is shown to the people on the saint's day, 3rd December. It was last shown in this way in 1878. Xavier was beatified by Pope Paul V. in 1619, and canonized by Gregory XV. in 1622. See "The Life and Letters of St. Francis Xavier" (two vols. London, 1872), and the lives by Tursellini (Rome, 1594), Bartoli (Lyons, 1666), Bonhours (Paris, 1621).

**XE'BE'G**, a small, lateen-rigged, three masted vessel of the Mediterranean (Arab. *zumbuk*, a small boat).

**XENOKRATES**, an eminent Platonic philosopher, succeeded Speusippos (Plato's immediate follower) as head of the Academy about 340 B.C., and retained the post till his death in 311 B.C. He was born in 396 at Chalkedon, a city on the shores of the Bosphorus, nearly opposite Byzantium. Like Speusippos, Xenokrates accompanied Plato on at least one of his visits to the court of Dionysius of Syracuse. The temperance and morals of Xenokrates were grave, not to say austere, in the extreme. His name was quoted in antiquity as almost a synonym for modesty and temperance. Xenokrates was a voluminous writer, but none of his works have come down to us.

**XENOPHANES**, an early Greek philosopher, was a native of Kolophon, an Ionic city in Asia Minor. He was born probably about 616 B.C., and died about 520 B.C. When he was grown to manhood Kolophon fell under the subjection of the Lydians, whose luxury and corrupt morals so much disgusted Xenophanes that he left the place, and took refuge in the recently founded colony of Elea in Southern Italy. Here he founded the Eleatic school of philosophy, the reputation of which was upheld and increased by his successors, Parmenides and Zeno. The opinions of Xenophanes were delivered in verse. He seems to have been a composer and reciter of various kinds of poetry, some fragments of which are extant. These relics have been collected, along with those of Parmenides and some other early philosophers, by Karsten, a Dutch scholar, and were published by him in 1830. The doctrines of Xenophanes were rather theological than philosophical. One of his principal aims was to disabuse the minds of his countrymen of the absurd ideas about the gods which had been instilled into them by the poems of Homer and Hesiod. He proclaims a pure monotheism, and teaches—

"One God, of all beings, divine and human, the greatest;  
Neither in body like unto mortals, neither in spirit."

He severely condemns the creed which holds that God is fashioned after the likeness of man. "Men," he says, "imagine that the gods are born, and are endowed with our form and figure."

"But if oxen and lions had hands like ours and fingers,  
'Then would horses like unto horses, and oxen to oxen,  
Paint and fashion their god-forms."

In order to speak intelligibly of the speculations of Xenophanes, it is necessary to keep in view the kind of truth which philosophy strives to reach and give expression to. The only kind of truth which philosophy recognizes, is truth as it exists for all intellect. An intelligence need not of necessity apprehend the universe as coloured, or sonorous, or solid, but it must of necessity apprehend it as *one*—as held together by some principle of unity. Xenophanes was the first who proclaimed this oneness of the universe; and Aristotle says, that "looking forth over the



expanded world, Xenophanes declared that the one in all things was God."

**XENOPHON**, the Greek historian, was born at Athens about 444 B.C. Of his youth and early manhood there is nothing known, except that he was one of the most distinguished of the little band of young men of superior culture and character who, towards the end of the Peloponnesian War, looked to Sokrates as their great teacher and example. His first public appearance is in the year 401, when he took service under Cyrus the Younger in his famous but ill-starred expedition against his brother Artaxerxes II., then on the Persian throne. Here he distinguished himself after the battle of Cunaxa, by heading that difficult retreat of the 10,000 Greek mercenaries over the highlands of Armenia to the shores of the Black Sea, which has become so famous in military history. Shortly after this we find him in the ranks of the Spartan army, and the constant confidential attendant of King Agésilas, having, indeed, been banished from Athens on a vague charge of Laconism. From this period he becomes altogether, both in local habitation and in political spirit, a Lacedæmonian, and appears with Agésilas at the field of Coronæa, 394 B.C., in which Athens, Thebes, and other Greek states contended unsuccessfully against the now dangerous dominancy of Sparta. After this date we do not find his name connected with any public event. He seems to have spent his time quietly and happily on his estate at Skillos in the Elean territory, on the banks of the river Selinos, a few miles south of Olympia, engaged partly in the execution of literary works, partly in those occupations and amusements of a Greek country gentleman which he has himself so gracefully described in several of his smaller works. He died at a good old age, about 354 B.C., and his name finds a prominent place in that curious list of remarkable men of great longevity which has been preserved for us in a separate form by the satirist Lucian. As a writer, Xenophon does not rank with the first-class men of the brilliant age to which he belonged; but certain accidental circumstances have conspired to give two at least of his works a place among the most highly valued relics of classical antiquity. His "Anabasis, or Account of the Expedition of the Younger Cyrus," combines the excellencies of a simple, natural, and polished style, and great variety of incident with a certain rare epic unity of story, not frequently to be found in so short a composition by a man of no extraordinary talent. His "Memoirs of Sokrates," like Boswell's "Life of Johnson," have a great moral and historical value, altogether independent of the writer. But Xenophon is not merely the faithful attendant of the wisest of Athenian wise men, but his intelligent admirer and emulous disciple. Of his other works, the most pleasant at once and the most instructive are his "Economics," and his treatises on hunting and horsemanship, which give the modern reader a significant peep into some interesting scenes of ancient Greek life, which do not appear on the great stage of more pretentious literature. His "Institution of Cyrus" (Kuropaideia) has maintained the reputation of a pleasing historical romance. His life of Agésilas shows, indeed, an intense admiration of the virtues of his royal patron, but it has neither the skillful portraiture nor the tone of healthy impartiality which characterize the charming biographies of Plutarch. The same want of impartiality and incapacity to attain a point of view that might set him above his present personal relations, appears in his "Hellenika," or history of Greece, from the year 411 B.C., where Thucydides breaks off, to the year 362 B.C., the date of the battle of Mantinea, which overthrew Spartan dominion in the Peloponnesos. The best edition of Xenophon's complete works is that of Schneider (Lipzig, six vols., 1815).

**XENYL'AMINE** or **MARTYL'AMINE** is found in the basic oils obtained in the manufacture of aniline. It

crystallizes in white needles which melt at 45° C. (113° Fahr.), and boil at 320° C. (608° Fahr.), distilling unchanged. The formula is  $C_{12}H_{11}N$ . It is a strong base, forming crystalline salts with acids. The formula of the hydrochlorate, which crystallizes in white needles, is  $C_{12}H_{11}NHCl$ .

**XERTEZ DE LA FRONTERA**, a town in Spain, situated near the right bank of the Guadalete, on the railway from Cadiz (63 miles distant) to Seville, with a population of 40,000. The old town, inclosed within the walls, has narrow and crooked streets; those of the new town, outside, are broad and regular, and contain a large number of good houses. There are numerous parish churches, a college, some convents and hospitals, an alcazar or fort (now in ruins), and many Roman and Moorish antiquities. Some woollen fabrics and leather are made here; but the only commerce of Xerez is in the wine of the surrounding district, the well-known *sherry*, which is principally sent to England *via* Cadiz. Its name is derived from that of the town, which is pronounced "Sharez." The magazines of the merchants are remarkable for their extent, and are called *bodegas*. The vineyards, chiefly situated on slopes, are scattered over an immense area. Owing to railway communication, large quantities of wine are now brought from inland to be prepared for market. On the plain outside Xerez was fought, in 711, the battle which finally overturned the Visigothic monarchy of Spain, and placed a large portion of the country under the dominion of the Moors for several hundred years.

**XER'XES** (the Greek way of writing the Persian *Kaithra*), the famous Persian monarch, was the son of Darius (Darius) and his queen Atossa, his second wife. He succeeded his father about the beginning of the year 485 B.C., being preferred by Darius to Artabazanes, his eldest son by his first marriage. In the second year of his reign he subdued Egypt, which had risen in revolt against the Persian yoke, and left his brother Achæmènes as its governor. During the next four years he was closely occupied with his vast preparations against Greece; soldiers were collected from every region of the Persian Empire, reaching from Central Asia to the inner countries of Africa. A naval force was supplied from its marine provinces. Prodigious stores had been for three years brought together and arranged at stations along the line of march. In 481 B.C. Xerxes wintered at Sardis, the Persian capital of Asia Minor. In spring he approached the Hellespont, and his army took seven days and seven nights to cross the strait by a bridge of boats at Abydos, the breadth being about a mile. The first bridge had been destroyed by a storm, and the principal engineers were beheaded by the enraged despot; in his frenzy he commanded the murely sea to be scourged, and that a pair of fetters should be thrown into it. The fleet rounded the southern promontory of the Thracian Chersonese. Army and navy joined near Doriskos, and here the king reviewed his enormous levies. The army consisted of 1,700,000 infantry, and 80,000 cavalry, with numerous chariots of war. The fleet was formed of 1207 triremes, each trireme being furnished with 200 rowers and thirty fighters, with 3000 vessels of inferior size; the number of men in all being 517,610. The men thus numbered 2,637,910. The camp followers, cooks, and motley attendants are estimated by the Greek historians as more than the men equipped for battle, giving a sum total of beyond 5,000,000. After the review Xerxes continued his march through Thrace by three different roads. On its arrival at Athos the fleet sailed through a canal  $1\frac{1}{2}$  mile in length, which had been dug across the isthmus. Herodotus vouches for this great work as if he himself had seen it; and modern travellers assert that traces and remnants of it may be distinctly found at the present day. Macedonia submitted at once to the invader, and Thessaly, on account of its various



passes, could not be defended. The first check which Xerxes met with was at Thermopylæ (Gr. *Thermopylæi*), where he was encountered by the brave band of Leonidas, all of whom fell for their country. On the same day the Greek fleet at Artemision attacked the Persian ships, which also soon suffered from a severe storm. The Persian king laid waste Phokis and Boiotia, and at length arrived at Athens. His fleet, having entered the Bay of Phalæron, was engaged by the Greek ships under Themistoklès. From a height on the land that overlooked "sea-born Salamis," the scene of the battle, Xerxes was a spectator, and witnessed the defeat and dispersion of his great naval armament. This battle of Salamis, so picturesquely described by Æschylus, himself one of the combatants, put an end to his immediate hopes of subduing Greece; the wreck of his fleet was ordered to the Hellespont, and his guard of 60,000 soldiers suffered greatly during the forty-five days of their retreat. The bridge of boats had been destroyed by a tempest; the king, alarmed for his personal safety, crossed hastily in a skiff, arriving at Sardis, beaten and baffled, eight months after he had started from it flushed with hopes of fame and conquest. Mardonios was left in Greece with 300,000 soldiers to complete the subjugation, as he imagined, but was defeated at Plataea. Xerxes, on his return to Sardis, abandoned himself to sensual pleasures. After a reign of twenty years Xerxes was assassinated by Artabanos and a eunuch called Spamtres or Mithradates, 465 B.C.

**XIMENES (or XIMENEZ) DE CISNEROS, FRANCISCO, CARDINAL**, a Spanish statesman and ecclesiastic, was born of poor but noble parents at Torrelaguna, New Castile, in 1436. He graduated in both civil and canon law at the University of Salamanca in 1456, and in 1459 went to Rome, where for six years he was advocate in the consistorial courts. He was appointed by the Pope to the living of Uzeda near his native place, and after being imprisoned for six years by the Archbishop of Toledo, who wanted the benefice for some one else, he obtained his rights. Other preferments followed, but in 1482 he became a Franciscan, and, after spending a few years in rigorous austerities, he was made superior of the convent of Salzeda. In 1492 he was appointed confessor to Queen Isabella, and in 1494 provincial of his order in Castile. In the following year he was nominated archbishop of Toledo and primate of Spain, and while he retained his simple habits and monastic dress, and disposed of most of his vast revenues in charity, he devoted himself with intense zeal to his public duties. Supported by the queen he carried out, in the face of bitter opposition, some greatly needed reforms in the morals and discipline of the religious orders; and by certain forcible measures, such as were in favour at that period, he "converted" large numbers of Moors to Christianity. On the death of Queen Isabella, in 1504, he became the most powerful statesman in Spain, and by his skill, courage, patriotism, and vigour he preserved peace between the rival claimants for the crown, kept in check the pretensions of the grandees, filled the royal treasury, brought the army and navy into a high state of efficiency, captured and annexed Oran, and sent a powerful expedition against the Barbary corsairs. On 17th September, 1517, the young king landed in Spain, and at once addressed a letter to the aged primate dismissing him from office. Ximenes was at this time lying ill of fever, and the letter arrived only a few hours before his death, which took place 8th November, 1517. He was a munificent patron of religion, letters, and art, and his will ever be remembered for his publication of the famous "Complutensian Polyglot." [See **POLYGLOTS**.] See also Prescott's "Ferdinand and Isabella," and Hefele's "Cardinal Ximenes" (two vols. Tübingen, 1811; second edition, 1851; an English translation of which appeared in London in 1860).

**XYLENE** or **XY'LOL** is one of the hydrocarbon, accompanying benzene and toluene in coal-tar naphtha. The formula is  $C_8H_{10}$ ; it is isomeric with dimethyl-benzene,  $C_6H_4(CH_3)_2$ , and with ethyl-benzene,  $C_6H_5(C_2H_5)$ . It is a light colourless oil, resembling benzene, and having the specific gravity 0.86. It boils at  $139^\circ C.$  ( $282^\circ F.$ ), and can be prepared artificially from monobromo-toluene. Xylene forms a number of derivatives with chlorine and bromine, called chloro-xylenes and bromo-xylenes. Ethyl-xylene,  $C_{10}H_{14}$  or  $C_8H_9(C_2H_5)$ , is a liquid having a specific gravity of 0.878, and boiling at  $183^\circ C.$  ( $361^\circ F.$ ). Nitro-xylene,  $C_8H_9(NO_2)$ , is a heavy oil boiling at  $240^\circ C.$  ( $464^\circ F.$ ). Dinitro-xylene,  $C_8H_7(NO_2)_2$ , is crystalline, and melts at  $93^\circ C.$  ( $199^\circ F.$ ). Trinitro-xylene,  $C_8H_5(NO_2)_3$ , crystallizes in needles which melt at  $177^\circ C.$  ( $350^\circ F.$ ). Xyleno-sulphate or xylylic mercaptan ( $C_8H_{10}S$ ) is a colourless oil boiling at  $213^\circ C.$  ( $415^\circ F.$ ) and insoluble in water.

**XYLIDINE**, a base homologous with aniline and toluidine, obtained from nitro-xylene. It is a colourless heavy liquid, boiling at  $214^\circ C.$  ( $417^\circ F.$ ), and having the formula  $C_8H_{11}N$ . It combines with acids, forming crystalline salts.

**XYLOIDIN** or **NITRAMIDIN** is an explosive compound obtained by the action of fuming nitric acid on starch. It is a white powder, having the formula  $C_6H_7NO_7$  or  $C_6H_7(NO_2)_3O_3$ . It is insoluble in water, alcohol, and ether, but quite soluble in glacial acetic acid. It detonates when struck with a hammer. It melts on heating, and takes fire at  $180^\circ C.$  ( $356^\circ F.$ ). The starch may be regenerated by acting on it with ferrous salts, which denitrate it, producing soluble starch and nitric oxide. A soluble modification of xyloidin, known as oxyxyloidin, can be obtained, which is soluble in alcohol and ether. Nitro-xyloidin or dinitramidin,  $C_6H_7(NO_2)_2O_3$ , is obtained from xyloidin by the action of strong sulphuric acid. It is a white powder, insoluble in water and alcohol, but soluble in ether. It is easily decomposed, and is reduced by ferrous salts in the same manner as xyloidin.

**XYLOPH'AGA** is a group of BEETLES belonging to the section Tetramera. This group contains only one family, Scolytidae, the members of which present a considerable resemblance to the **WEEBLS** (Curculionidae), but have a short broad muzzle instead of the proboscis with which the latter beetles are provided. The Scolytidae are small beetles, with short club-shaped or leafy antennæ. The species are numerous and are wood-borers, doing much destruction to timber trees. The perfect insect burrows in the bark to deposit its eggs, and the larvæ, when hatched, excavate spreading galleries within the cambium layer of the wood. *Scolytus destructor* is a little cylindrical brown beetle, common in England, which is very destructive to elm trees. *Hylesinus fraxini*, another common British species, attacks the ash. *Hylbergus piniperda* is so destructive to the Scotch fir or pine that numerous trees are destroyed by it annually in plantations and forests. *Platypus cylindricus*, another British species, burrows in the solid wood of oaks and beeches.

**XYLOPIA** is a genus of plants belonging to the order **AXONACEÆ**. The species are trees or shrubs, natives of tropical South America and the West Indies. They are remarkable for the aromatic properties of their fruits, and for the bitterness of their wood. The fruits of *Xylopia aromatica* and *Xylopia frutescens* are used by the natives as a substitute for pepper, and are sometimes designated Ethiopian pepper. The tough bark of the *Xylopia sericea* and of *Xylopia frutescens* is manufactured into cordage. *Xylopia glabra* yields the bitter-wood of the West Indies, an effectual preservative against insect attacks. When fresh gathered the berries have an agreeable flavour.

**XYLORETIN**, a crystalline resin, isomeric with camphor, which is found in fossil pine trunks. It has the

formula  $C_{10}H_{16}O$ . Xylorotin is insoluble in water, but it is soluble in alcohol and in ether. It melts at  $165^{\circ}C$ . ( $329^{\circ}F$ .)

**XYLYLIC ACID**, an acid obtained by the action of sodium and carbonic acid on bromo-xylene. It is homologous with benzoic and toluic acids. It crystallizes in white needles, having the formula  $C_9H_{10}O_2$ . It is insoluble in water, but very soluble in alcohol and ether. The crystals melt at  $103^{\circ}C$ . ( $217^{\circ}F$ .), boil at  $273^{\circ}C$ . ( $523^{\circ}F$ .), and sublime unchanged. Chromic acid oxidizes it and converts it into isolineic acid ( $C_9H_8O_4$ ). It forms crystalline salts with bases; the formula of the calcium salt is  $(C_9H_7O_2)_2Ca_2H_2O$ . Xylylic ether is an aromatic oil boiling at  $233^{\circ}C$ . ( $451^{\circ}F$ .)

## Y

**Y** has found its way into the alphabets of Western Europe through the later Latin alphabet. The letter, much like Y in our oldest English, is really a sign for *y*. When this letter had disappeared by the confirmed use of the Roman alphabet it was replaced by the ordinary *y*; and *ye*, *ze*, became *y*, *ye* (for "the," "that"). The *p* was, of course, understood to be used, and was pronounced as *th*. This extraordinary corruption continued until comparatively late times. Instances are not uncommon down to the present century.

The sound of *y*, so familiar to the English at the beginning of words, as in *yes*, *young*, *yoke*, was represented in Latin by a mere *i*, which, however, when so used, received from the grammarians the distinctive name of *i consonans*. Our modern editors have, for the most part, substituted for it a *j*. Thus *iugum*, or rather *iugum*, which is now written *jugum*, commenced with a sound which is commonly held to have been the same with our initial *y* in *yoke*. The insertion of the sound of a *y* before vowels is very characteristic of the Russian language, the alphabet of which has no less than four symbols which do not such a sound. The English, too, have a habit of expressing the sound, though they do not write the letter, whenever a long *u* begins a word, as *union*, *unity*, *useful*; so that those who write an *useful contrivance* insert a letter at the end of the first word which no one would pronounce. In Anglo-Saxon the sound of a *y* was commonly represented by an *e* before *a* or *o*, and by an *i* before *e* or *u*, in which cases the allied languages of Iceland, Denmark, and Sweden for the most part employ a *j*. Thus the Anglo-Saxon writes *eorl*, *Eotoland*, *eor*, *Eadward*, *eakta*, *beot-an*, for *earl*, *Jutland*, *you*, *Edward*, *eight*, *to bid*. The sound of *y* again is heard where the French write *il* or *gn*, as in *vaillant*, *agneau*; in the Spanish *il* or *n*, as in *Mallorca*, *Coruna*; in the Portuguese *lh* or *nh*, as in *filho*, *Mindo*; and in the Italian *gl* or *gn*, as in *figlio*, *agnella*. For the interchange of *y* with *g*, see *G*; for the use of *z* with the sound of *y*, see *Z*; lastly, for the connection between the sounds of *j* and *y*, see *J* and *Z*.

**Y, THE**, pronounced *Eye*, in Dutch *Iet*, *Ij*, an arm of the Zuider Zee on its west side, in the province of North Holland, 21 miles in length, with an average breadth of little over a mile. The city of Amsterdam is situated on its south shore. It approaches within 2½ miles of the North Sea coast, and a ship canal has been constructed across the peninsula, thus giving a much shorter and more convenient access to the port.

**YABLONOI' MOUNTAINS**, a range of East Asia, forming a prolongation of the great central axis of the continent to the shores of the Sea of Okhotsk, and connecting with the Stanovoi Mountains. They are of no great altitude, Mount Sohondo (8300 feet), near the west

**XYRID'ÆE** is an order of plants belonging to the class Monocotyledons, series Coronariæ. [See BOTANY.] The species are not numerous, and chiefly natives of the tropics of both hemispheres. They are rush-like or sedge-like herbs with fibrous roots, narrow sword-shaped radical leaves, sheathing the base of a naked scape, which is terminated by a head of flowers inclosed in imbricated scales. The perianth consists of three outer glumaceous segments and three inner petaloid segments: there are three stamens inserted upon the claws of the inner segments of the perianth. The fruit is a three-valved, one-celled, many-seeded capsule. Little is known of the properties of this order. Some species of *Xyris* are used as remedies for cutaneous diseases in India and America.

extremity, being probably the culminating point, decreasing in elevation eastward. The range forms the water-parting between the basins of the Amur and Lena rivers.

**YACHT**, a sailing boat kept for pleasure, as for travelling or for racing, &c. There are three principal rigs for yachts: cutter, schooner, and yawl. There are also mudians, luggers, brigs, and sloops, but they are comparatively rare; and there are now likewise several steam yachts belonging to the various clubs. A cutter has one mast and a running bowsprit, and usually carries four sails, viz.—mainsail, gaff-top-sail, foresail, and jib. A square sail is also frequently set by the larger vessels of this class, but it is not allowed at regattas. A schooner has two masts—mainmast and foremast—a standing bowsprit, and jibboom, or not unfrequently instead of these, a running bowsprit like that of a cutter. Schooners are either "fore-and-aft" or "square-top-sail," the former being the prevailing rig among yachts. A fore-and-aft schooner carries a mainsail, main-gaff-top-sail, foresail, or fore-spencer, as it is sometimes called, fore-gaff top-sail, fore staysail, and jib; while a square-top-sail schooner has a square-top-sail and top-gallant-sail on the fore-topmast. A yawl is rigged exactly like a cutter, with the addition of a small mizzen mast. It is a very convenient cruising rig, and is becoming common for yachts over 50 tons.

**YAK** (*Poephagus grunniens*) is an animal of the ox family (Bovidae); a native of the elevated plains of Tibet, where it is found both in the wild and domesticated state. Its nearest allies are the Bisons, from which it differs chiefly in the distribution of its long silky hair, which thickly covers the whole body and forms a long fringe along the back, being collected into a bunch over the shoulders like a hump; it is also very long on the flanks and thighs, reaching almost to the ground, and completely invests the tail. In colour the yak is generally black, with spots of gray or white on the face; but the tail and the long hair on the ridge of the back are frequently white. In height and in the form of the body, head, and limbs it resembles our domestic oxen. The horns are large and are directed outwards, forwards, and then upwards. The yak inhabits the wildest mountains, and is found, as a rule, at a greater elevation than any other animal, feeding on coarse grasses, generally at night or in early morning. It utters a short grunting sound like a pig, whence it is often called the grunting ox. It is easily tamed and is kept in the domesticated state by the natives of Tibet, both as a beast of burden and for its milk and flesh. The butter made from the rich milk is an important article of commerce, and the curd made from it is also used largely by the natives. The flesh is highly esteemed, and that of the calf is said to be superior to veal. The hair is made into ropes, tent

coverings, and cloth; and from the hide are prepared blankets and articles of clothing. The tail is used as a fly-switch, under the name chowry, in great ceremonies in India; it is also dyed and used as an ornament by the Chinese.

**YAKUTSK'**, a town of Asiatic Russia, in Eastern Siberia, situated on the left bank of the Lena, nearly 5000 miles distant by road from St. Petersburg, 1100 miles north-east of Irkutsk, and 700 miles from Okhotsk on the shore of the Pacific Ocean. It is surrounded by extensive forests and marshes, remarkable for the intensity and duration of its wintry cold, which political offenders of rank have been doomed to experience by exile to this dreary site. But it is the centre of the fur trade of Eastern Siberia, and has important traffic in ivory obtained from the walrus of the Arctic Ocean, as well as in the fossil kind procured from the remains of extinct animals found embedded in the frozen soil of the Lena valley. The place puts on an animated appearance in the summer months, when annual fairs are held. The native hunters then bring in their tusks, skins, and furs; and manufactured goods arrive from Irkutsk by the river to be exchanged for them. A month is required for their passage. They reach the Lena by an overland transit of about 100 miles, and are embarked at a point where the river is as broad as the Thames at London, though with a course of more than 2000 miles still to be accomplished. Butter is also brought by the natives to the Yakutsk market, which is forwarded on horseback through 700 miles of swamps and woods to Okhotsk, wholly dependent upon this distant supply.

**YAM.** See **DIOSCOREACKEE**.

**YANG-KIN** is the Chinese variety of the **DULCIMER**.

**YANG-TSE-KIANG'**. See **CHINA**.

**YANKEE**, the popular name for an inhabitant of the United States in England, but in America only applied to a New Englander, seems to be a corruption of the word "English" (Yengees, Yangees, Yankees) by the North American Indians. It appears to have been first employed derisively about 1775 by the British soldiers in the War of Independence. "Yankee Doodle," the favourite American air, was originally Nankee Doodle, and the words belonging to it were composed, it is said, in ridicule of Oliver Cromwell. It became popular in America during the revolutionary struggle, and the word "Nankee" readily changing into "Yankee," it was soon adopted as the national melody. That honour, however, is now given to "Hail, Columbia."

**YANINA.** See **JANINA**.

**YAPOCK** (*Chironectes variegatus*) is a marsupial mammal belonging to the **OROSSUM** family (Didelphidae). It inhabits the river banks of Brazil and Guiana, and is wholly aquatic in its habits, swimming and diving well, and feeding on small fishes, crustaceans and other aquatic animals. The yapock is a little more than a foot in length, exclusive of the tail, which is scaly and prehensile, and nearly as long as the body. The upper surface is brown, marked with transverse bands of gray, and the under parts are white. The hind feet are large and webbed. It has a perfect pouch or marsupium. The muzzle is sharp, and the ears large, rounded, and naked.

**YARD.** See **STANDARD MEASURE**.

**YARE**, a river of England rising in the county of Norfolk, through which it flows for 50 miles past Norwich to the North Sea near Yarmouth, just above which it expands into a lake, called Bredon Water, which receives the **Wayney** and the **Bure**. It is navigable to Norwich, at the confluence of the **Wensum**, its largest tributary.

**YARKAND RIVER**, a river of Central Asia, rising on the north slope of the Karakorum Mountains, in Cashmere, 17,000 feet above sea level, traverses the elevated plateau between the Karakorum and Kuen-Lun Mountains in a north-west and north direction; breaking through the

latter, it flows generally north-east across the plains of Chinese Turkistan, and through the west portion of the desert of Gobi to join the Kashgar, Khotan, and Ak-su rivers, when it takes the name of Tarim, and, flowing east, enters Lake Lob. To the Kashgar River its length is about 650 miles. In the winter its whole course is frozen.

**YARKUND'**, a town of Chinese Turkistan, situated near the left bank of the Yarkund or Zarafshan River, 100 miles south-east of Kashgar, in a fertile plain between the Kuen-Lun Mountains and the desert of Gobi, at an elevation of 3923 feet above the sea level. There are numerous mosques, medreshes, caravanserais, and large bazaars, and it is a very important commercial emporium. Horse, cattle, and grain markets are held in various parts of the city, and there are manufactures of gold and silver cloths, cotton, silk, carpets, &c. English goods have been sent direct to the town, and a large trade is carried on with India.

**YARMOUTH** or **GREAT YARMOUTH**, a sea-port, market-town, and municipal borough, in Norfolk, is 121 miles north-east by north from London by the Great Eastern Railway, and 124 miles by the road. It is situated on the coast of Norfolk, at the junction of the **Bure** with the **Breydon Water**, which latter is a lake formed by the confluence of the **Yare** and **Waveney**. The **Bure** having joined the other two rivers at the mouth of the **Breydon Water**, the united stream, then called the **Yare**, flows south, nearly parallel to the shore about  $2\frac{1}{2}$  miles, and then, turning east, enters the sea, thus forming a peninsula. The town is built on the east banks of the **Bure** and the **Yare**, about half a mile from the sea-shore. There is an iron drawbridge, 86 feet in length, crossing the **Yare** to the suburb of Southtown, or Little Yarmouth, in Suffolk, and connected with Southtown is the village of Gorleston, near the mouth of the river. The **Bure** also is crossed by a suspension bridge. Yarmouth itself consists chiefly of four streets parallel with the rivers, and connected by nearly 160 alleys called Rows, which intersect them at right angles. The rows are only from 5 to 8 feet wide, and are thus too narrow to be traversed by ordinary wheel carriages; the traffic is, therefore, carried on in what are called Yarmouth carts, which are narrow, have very low wheels, and look like sledges, but are very suitable for the conveyance of heavy goods. The chief buildings in the town are several churches, including St. Nicholas' cruciform spire church, of the twelfth century, 250 feet long and 108 feet wide, being one of the largest in England; the church of St. Andrew, and St. John's fishermen's church; a Roman Catholic church, and several chapels; Jews' synagogue; town-hall, built in 1723; council-house; corn exchange, built in 1871; public library; handsome town-hall, built in 1880; municipal buildings, opened in 1882; large military barracks and armoury, the former used as an invalid hospital; militia barracks, sailors' home, theatre, assembly rooms, and public baths; grammar-school, built in 1871; workhouse, and two hospitals. There are several banks, breweries, corn mills, and malt-houses, and a silk factory in the borough; also timber and ship-yards, but shipbuilding has much declined. By the side of the river is a handsome quay, 2000 yards long and 150 feet broad, planted with trees, and considered one of the finest in the kingdom. Part of the town walls, erected in the time of Henry III., are still in existence.

The harbour, which is formed by the mouth of the **Yare**, has sufficient water for vessels of 300 tons burden to ascend to the quays. It is protected towards the sea, and some very extensive works have been carried out for still further improving it. There is a handsome marine parade  $1\frac{1}{2}$  mile in length, lined by houses. There are two piers and a jetty. In the Yarmouth Roads, outside the river—which are protected as far as possible by means of buoys

and floating lights—there is generally safe anchorage in 15 to 18 fathoms, among the surrounding sands.

The chief trade of Yarmouth is in fishing for herrings and mackerel, and in the curing and exportation of them. The herring fishery, which commences in the middle of September and continues till the end of November, gives employment in various ways to a large number of men, women, and children. The fishing-ground extends upwards of 40 miles to seaward, in from 15 to 20 fathoms of water, along a considerable extent of the coast. In the early part of the season large quantities of fresh herrings are disposed of, and sent far inland by the railways; but the main object is to obtain a sufficient supply for curing. The best and full-grown fish, known as "bloaters," are simply salted; the remainder, sold as "red herrings," are both salted and smoked. The other fish caught near Yarmouth, including soles, whiting, cod, turbot, and haddock, in great abundance, are generally sent to London daily in a fresh state. A commodious fish-market was provided by the corporation in 1867, and in 1868 an extensive range of buildings for the corporation buoys, &c., was erected, with tower 75 feet high. The town derives some advantage from the supply of provisions to the fishermen and the ships in the harbour. The exports from Yarmouth consist chiefly of grain, malt, and herrings, the latter being sent in large numbers to the countries bordering on the Mediterranean. Timber, coals, wine, and salt are imported. Steam packets run regularly to London, Hull, Goole, &c. The number of vessels registered as belonging to the port, in 1888, was 720 (35,000 tons). The entrances and clearances each average 1200 (150,000 tons) per annum.

Yarmouth has several public gardens and promenades, and is very much frequented as a watering-place, for which its salubrity and firm shelving sea-beach make it very well adapted. The air is, however, too bracing for delicate constitutions.

The municipal borough—divided into six wards and governed by a mayor, twelve aldermen, and thirty-six councillors—had a population in 1881 of 46,749. The town is a parliamentary borough, and returns one member to the House of Commons.

Yarmouth has always been an important nursery for seamen, and is mentioned as a fishing place of some note in Domesday Book. On the Denes—a piece of open ground adjoining the town—stands a fine statue of Nelson, 141 feet in height; and several batteries are situated at different parts of the coast. In the immediate neighbourhood lie the ruins of Caistor Castle, and some remains of the Roman station Gariannonum.

At a remote period, the ground on which Yarmouth stands formed part of the bed of a great estuary, which extended as far as Norwich. It first became firm and habitable land about the year 1008. Within the last five centuries the mouth of the Yare has been diverted about 4 miles to the south. The shape of the sandbanks beyond the Yarmouth Roads varies slowly from year to year, and often suddenly after great storms.

**YAR MOUTH**, a small but ancient market-town of

England, in the Isle of Wight, situated at the mouth of the estuary of the Western Yar. It has an excellent roadstead, and communication with Lymington, on the Hampshire coast, is maintained by a daily steam-packet service. Boats also run between Ryde, Cowes, and Yarmouth in the summer. It has a town-hall and market-house, a church, Methodist and Baptist chapels, and a pier opened in 1876. The castle, or fort, built by Henry VIII. in 1544, enlarged and strengthened, in conjunction with the defences at the Needles, Sconce Point, and Cliff End, and Hurst Castle, on the opposite or Hampshire shore, add greatly to the security of the entrance to the Solent. The George Inn was formerly the mansion of the governor of Yarmouth. It was built by Sir Robert Holmes, who entertained Charles II. here in 1661 and 1675. The neighbourhood of Yarmouth is full of interest. At Freshwater, the birthplace of Dr. Robert Hooke, the mathematician, is an ancient church of transition Norman design. Freshwater Gate, on the south-west coast of the island, derives its name from its position at the only gate, or entrance, in the barrier of chalk downs, which stretches from Brighthelm to the Needles. The population of the town and parish, in 1881, was 787.

**YARN** is thread spun for weaving cloths of various kinds. Its value mainly depends upon uniformity of thickness, and it is to obtain this that the efforts of the best makers are directed. Yarns are spun into a great variety of sizes, according to the purposes for which they are intended, and the adoption of a uniform system of measurement has become of late years a measure greatly to be desired in the interests of international trade. In Great Britain the system of measurement is based upon the pound weight of material, and its division into *hanks* or *cuts*. Thus a hank or lea of linen yarn consists of a length of 300 yards, and if it takes thirty of these hanks to make a pound the yarn is called 30s; if thirty-five, 35s, and so on. In floss or spun silk there are 810 yards to a hank; in woollen and worsted yarn 560 yards to the hank or skein.

The greatest successes in fine spinning have been obtained in cotton yarn, which is made up in hanks of 840 yards. In this material Messrs. T. Houldsworth of Manchester have produced yarn numbered as 700s, or which requires 700 hanks to make a pound, and from this thread muslin has been woven. As a curiosity they have also produced yarn too fine to be measured, but which is estimated to be about 8000s.

Some years ago a complex system of yarn spinning, by which the overtwisting of one or more yarns, of one or more colours on a ground or body yarn, might be effected, was introduced on the Continent. The method was guarded as a trade secret, but the British manufacturers soon designed machinery by which they were enabled to compete on favourable terms with their rivals.

The exportation of yarn has now become very extensive, the perfection of English spinning-machines enabling foreign weavers to buy ready-made yarn cheaper, in many cases, than they can spin it themselves. The quantities exported in 1887 were:—

Description.	Quantity.	Value.	Countries to which the largest Quantities were exported.
	Lbs.	£	
Cotton yarn, . . . . .	251,037,200	11,379,485	Germany, Holland, France, Turkey, Italy, Egypt, India, and China.
Linen yarn, . . . . .	16,376,900	939,877	Spain, Germany, Holland, and France.
Silk yarn, . . . . .	—	438,956	Holland, France, and Germany.
Woollen and worsted yarn, .	40,165,100	3,970,205	Germany and Holland.
Total, . . . . .	—	16,728,523	

**YAROSLAV.** See JAROSLAV.

**YAR'RA** or **YARRA-YARRA**, a river of Australia in Victoria Colony, which flows south-west past Melbourne into the head of Port Philip, 5 miles below that town, to which it is navigable for vessels of 200 tons. It has a length of 90 miles. The tide ascends to falls a little above Melbourne; ordinary rise,  $4\frac{1}{2}$  feet; spring rise, 7 feet.

**YAR'RIBA** or **YOR'UBA**, a country of West Africa, Upper Guinea, situated west of the Niger, between the Slave Coast and the Kong Mountains. Much of it is covered with forests, but it has wide tracts of fertile land, and a large population, lying chiefly in towns and villages, fortified against attacks from the Fellatahs. The capital is Abbeokuta; Ibadan and Ilorin are also populous towns. The area is probably about 18,600 square miles; the population is estimated at 3,000,000.

**YAWL.** See YACHT.

**YAWN'ING** is an act of respiration which differs from many others in being always more or less involuntary. It is attended by stretching of various muscles about the palate and lower jaw, analogous to the stretching of the muscles of the limbs, which gives relief to a weary man. The two actions often occur together, indeed. The involuntary character of yawning depends on the fact that the muscles which produce it are all more or less involuntary, and require something more than mere will to set them in action. Like sneezing, yawning is difficult to accomplish to order.

**YAWS** or **FRAMBOËSIA** (Fr. *framboise*, a raspberry), the name of a disease almost entirely confined to the African race, but which is common among them both in their native country and in the West Indies. The disease first shows itself as an eruption of yellowish or whitish spots upon the skin, the parts most liable to the affection being the face, neck, limbs, feet, genital regions, and arms. The spots gradually increase in size, and after a time the skin breaks, disclosing a round spongy mass, yellowish or pinkish in colour, from which oozes a dirty-yellow fetid secretion, and this spongy mass continues to enlarge and projects considerably from the surface. In the large pustules the surface becomes elevated into a red granulated excrecence, not unlike a wild raspberry, which is the true and characteristic yaw. At a later period the fungus shrinks in size, the eruption subsides, and the place heals, leaving only a discoloured scar. The usual duration of yaws under proper treatment is from two to four months in mild cases, up to about thirteen months where the disease is severe, but it may endure for several years with periods of quiescence. It occurs as a rule only once in a lifetime. Yaws are epidemic, and are also contagious by actual contact, the poison being sometimes conveyed from one person to another by flies. The period of incubation is supposed to be from three to ten weeks. Treatment consists in enforcing cleanliness, in generous diet, the local use of carbolic acid lotions or diluted nitrate of mercury ointment, and employment of constitutional remedies, of which the more important are mercury, iodide of potassium, tonics, and aperients. The natives have also several herbal remedies for internal and external use.

**YEA** and **YES.** *Yea* is the same as "verily," the simple affirmative form: *yes* is a strengthened form, often accompanied with an oath in our early writers, though the latter has now almost superseded the former. *Yea* (Old English *gea*) is the same word as the Teutonic *ja*. *Yea* answers to the Sanskrit *ya*, and to the Greek *ἔε*, which are demonstrative pronouns, showing the original Aryan affirmative motion to have been "in that way," i.e. "just so," a form still in frequent use. *Yes* (Old English *gise*, *geae*) is *gea* + *sy*, "yea, let it be so," *sy* being the imperative form from the ARYAN ROOT  $\sqrt{\text{as}}$ , to be.

In early times, and down to the middle of the sixteenth century, *yea* was the ordinary affirmation, and *yes* was

only used to a question negatively framed. "Art thou a prophet?" "Yea." "Art thou not a prophet?" "Yea." This is clearly shown by a long attack of Sir Thomas More's upon Tyndale for confusing the two (as also *nay* and *no*) in his Bible. In his "Confutacyon of Tyndale's Aunswere" (1532) he raises this point among others, though, as he admits, it is but trivial, because he says if a man does not even know these small matters how can he dare attempt to translate the word of God? The two words were quite confounded in less than a quarter of a century after More wrote.

**YEAR**, the term used to describe the earth's movement round the sun. But there are various sorts of year. If we take the year from one vernal equinox to another we have the shortest year possible, because the equinoxes recede and meet the sun, thereby shortening the year. [See PRECESSION.] This is the *solar* or *tropical* year, and its mean duration is 365 days 5 hours 48 minutes 46.05 seconds.

But if we observe the sun in conjunction with a star (i.e. in a direct line with it), and count as our year the time it takes to reach that conjunction again, we get the longer *sidereal* year, whose mean is 365 days 6 hours 9 minutes 9.6 seconds.

And if again we take the time that elapses between two successive passages of the earth through perihelion or aphelion, then, since these points have a motion forward in the heavens, we get the longest year of all, the *anomalous* year, whose mean duration is 365 days 6 hours 13 minutes 49.3 seconds.

As the solar year, which is the year of our almanacs, is not divisible by twelve, nor indeed does it contain a precise number of days, the division into months is made irregular, and the accumulated fractions of a day will amount to about a day extra in every four years. These discrepancies are what the CALENDAR strives to overcome. See that article.

The years given above are those of our earth. The other planets differ widely in their years from us and from each other. The year of Mars takes 686 of our days, that of Jupiter 4333, and that of Saturn 10,759 terrestrial days.

**YEAST** is the substance which produces FERMENTATION in fluids containing sugar, converting the greater part of the latter into alcohol. In the process of fermentation of the juice of any fruit containing sugar, as the grape or the apple, the whole fluid becomes turbid, carbonic acid gas is given off, and a frothy scum rises to the surface. If a drop of this scum be examined under the microscope, it will be found to consist of a fluid in which numerous minute corpuscles are floating, either singly or collected into heaps or strings. These corpuscles are the essential part of the yeast, and are minute fungi known as *Torula* or *Saccharomyces Cerevisie*. The yeast plant consists of a single round or oval cell, averaging about 1-3000th of an inch in diameter. The cell is composed of protoplasm, and is bounded by a cell-wall, consisting of a kind of cellulose. The protoplasm contains neither nucleus nor starch-granules, but watery vacuoles and oil-granules may be present. In saccharine fluids the yeast plant rapidly multiplies by a process of budding, forming chains, which after a time break up. When the yeast is dried slowly at a low temperature it is reduced to fine powder, composed of the yeast corpuscles, which are readily diffused through the air, and excite fermentation in any exposed saccharine fluid. The yeast corpuscles are killed by boiling or by exposure to a heat of 100° C. In the process of fermentation about 90 per cent. of the sugar is converted into alcohol and carbonic acid, about 6 per cent. into glycerine and succinic acid; the remainder is probably used in supplying carbon to the yeast plant. The presence of a certain percentage of alcohol in the fermenting liquid stops

the further growth of the yeast, which then sinks to the bottom. When yeast is placed in a saccharine fluid spread on a thin plate and exposed freely to the air it does not excite fermentation, and no alcohol is produced. Under certain circumstances, as when the yeast is spread thinly on a plate of plaster of Paris or a slice of a potato and kept moist, a process of reproduction by spore-formation takes place, each cell breaking up into four spores, which are set free by the dissolution of the cell-wall of the parent cell, and become each a new yeast-plant. The yeast-plant has never been observed to produce a mycelium like other fungi; but on the other hand the common Mould (*Mucor mucedo*), when submerged in a saccharine fluid, produces rounded corpuscles, undistinguishable, except that they are rather larger, from the yeast corpuscles, which cause a similar fermentation.

Yeast is largely used in the process of brewing [see BEER], and also for making BREAD. The addition of yeast, also called *barm* by bakers, sets up a kind of fermentation, resulting in *leavened*, as distinguished from unleavened bread. That used by bakers is chiefly German yeast, which is dried yeast imported in large quantities from parts of Germany and Holland.

**YEDDO.** See TOKIO.

**YELLOW**, one of the three primary colours. A mixture of pure yellow light with pure blue light produces white light; but a mixture of yellow and blue pigments produces green. Yellow and red pigments produce orange. Citron is the yellow tertiary—i.e. when blue, red, and yellow pigments are mixed, the latter in preponderance; or in other words, when green and orange pigments are mixed.

The chief yellows are gamboge (bluish), yellow ochre, Naples yellow, chrome yellow, Indian yellow, gallstone, Roman ochre, raw sienna, Italian pink (yellow lake), very susceptible to the action of light or metal, cadmium yellow, and yellow orpiment.

Yellow ochre is a natural argillaceous earth, coloured with iron salts. Yellow orpiment (i.e. *auri-pigmentum*, golden pigment), also called *yellow arsenic* and *king's yellow*, is a compound of arsenic and sulphate, which verges towards orange as the arsenic is increased. The best is native in Persia, and is called golden orpiment. It is bright and pure in tint, but dries slowly, and is not durable.

**YELLOW COPPER ORE**, a common name of CHALCOPYRITE or copper pyrites. It is so named in contradistinction to erubescite or purple copper ore.

**YELLOW FEVER**, the name given to a pestilential contagious fever of a continuous and special type. It appears to have originally developed in tropical and insular America, and it was first observed by Europeans in connection with the discovery of America towards the close of the fifteenth century. At the present day it occurs only in regions between 45° N. and 35° S. lat., and it depends for its origin and spread upon a temperature not lower than 70° Fahr. It is endemic in the West Indies, and some authorities are disposed to think it *originates* nowhere else, but the poison of the disease seems to be readily conveyed from place to place, and where the local circumstances favour its spread, the fever assumes the form of an epidemic of terrible severity. An epidemic of yellow fever which raged in New Orleans between May and October, 1878, caused the death of 4056 persons out of a population of 210,000. It is sometimes conveyed to colder countries by ships and infected goods, but in these it seldom spreads to any extent, and ordinary precautions at the maritime hospitals generally succeed in keeping the attendants and other patients from infection.

The disease presents two well-defined stages. The first, which extends from 36 to 150 hours according to the severity of the fever, is characterized by severe pains in the head and back, flushing of the countenance, hot skin, a rapid circulation, and a marked increase of temperature.

In the second stage the skin becomes yellow, there is much depression of the nervous and muscular powers and of the circulation, the mind wanders or there may be violent delirium, and after some uneasy sensations in the epigastrium spontaneous vomiting sets in, the ejected fluid being at first pale, but subsequently black, and having the appearance of coffee-grounds.

Yellow fever is a very fatal disease, the mortality varying in different localities and epidemics from 10 to 70 per cent. No specific is known for the disease, and it is not possible to alter its course by the administration of drugs, but much may be done to help the patient by insuring free ventilation, a proper temperature, suitable diet, and by careful medical attention to the functions of the skin, kidneys, liver, alimentary canal, &c. Persons who survive an attack of yellow fever generally secure immunity from the disease for the remainder of their lives.

**YELLOW RIVER.** See CHINA.

**YELLOW-HAMMER or YELLOW BUNTING** (*Emberiza citrinella*) is a species of BUNTING (*Emberiza*), common in Britain and throughout the continent of Europe. It measures about 7 inches in length. In the male the head, neck, and the whole lower surface of the body is bright lemon yellow, with reddish-brown spots on the breast and sides; the back, wings, and tail exhibit various shades of brown and black, with some of the feathers edged with yellow. The female is a little smaller than the male and less vividly coloured. The yellow-hammer frequents hedges and low trees, and feeds on grain, seeds, and insects. In the winter it is gregarious, and associates with the flocks of sparrows, chaffinches, and other small birds which congregate near farmyards and houses. The nest is built on or near the ground, usually under the shelter of some thick bush, and is composed of moss, roots, and hair, very firmly interwoven. The eggs are four or five in number, pale purplish-white, with dark reddish-brown streaks and spots. The note of the male is sweet and repeated, and is considered by the rustics in some parts of England to resemble the words—"A little bit of bread, but no cheese." Like the ortolan, this bird is caught in great numbers in Italy and fattened for the table.

**YELLOWSTONE NATIONAL PARK**, a district of the United States of America, in the Wyoming and Montana territories, constituted a national park in 1882. It is an immense square space lying between 41 and 45 degrees of north latitude, the latitude of Bordeaux, Turin, and Genoa, but at a far greater altitude from the sea-level. It is 65 miles from north to south by 55 from east to west, comprises 3575 square miles, and is in its entirety more than 6000 feet above the level of the sea. Yellowstone Lake has an altitude of 7788 feet, and the mountain ranges, which hem in the valleys on every side, rise to 10,000 and 12,000 feet, and are covered with perpetual snow. Geologically, as well as geographically, this tract of country is in the highest degree remarkable. The entire region was at a comparatively recent geological period the scene of volcanic activity, the last stages of which are still visible in the hot springs and geysers. In the number and magnitude of these the park surpasses all the rest of the world. There are, according to reports and surveys accurately made for the United States Government, probably fifty geysers throwing a column of water of from 50 to 200 feet, and from 5000 to 10,000 springs, chiefly of two kinds, those depositing lime and those depositing silica. The deposits formed by some of these springs are very remarkable, as forming natural bathing places, beautiful in form and of great variety of colour. The temperature, however, is generally excessively high, ranging from 160 to 200 degrees. The principal groups are the upper and lower geyser basins of the Madison River, and the calcareous springs on Gardiner's River. Looked on as a



watershed the park is the most interesting region in North America, having within its limits or neighbourhood the sources of vast rivers flowing in various directions. Towards the Pacific side are the head waters of the Snake River, flowing into the Columbia, and through it into the Pacific, and those of the Green River, an affluent of the great Colorado River, which empties into the Gulf of California. Towards the Atlantic flow the head waters of the Missouri affluents, including that most remarkable river the Yellowstone. The Upper Yellowstone rises, like the Snake, on the very Great Divide itself, but flows in an opposite direction into the Yellowstone Lake, a fine sheet of water, lying a little south of the centre of the park, 22 miles long, and from 10 to 15 wide, nearly inclosed by snow-clad mountains rising 4000 or 5000 feet above its already great elevation. The beautifully clear waters of this mighty mountain lake, which recalls to memory that on the so-called "roof of the world" among the Pamirs of Central Asia, are full of trout. Around part of its margin is a belt of hot springs.

The Upper Yellowstone is only 25 miles long when it enters the lake, but the Yellowstone proper, which emerges from it, has a run of 1300 miles before it enters the Missouri. All the more magnificent scenery on the Yellowstone River is within the limits of the park, and includes the Upper and Lower Falls. The Grand Canon, with perpendicular sides from 200 to 500 yards apart, rises to the height of 1200 or 1500 feet. Just below the Grand Canon the river receives Tower Creek, which is a rapid snow-fed brook, 12 or 15 feet wide and one or two feet deep. The creek flows for about 10 miles through a narrow, rugged, and precipitous canon inclosed by walls 300 feet high. Two hundred yards above its entrance into the Yellowstone the stream pours over an abrupt descent of 132 feet into a deep gloomy gorge, so narrow that the sun's rays scarcely penetrate it. This extraordinary tract of country is connected with the Northern Pacific Railway at Livingston, Montana, and is thus accessible to tourists from either the eastern or western seaboard of the United States.

**YELLOWSTONE RIVER**, a river of the United States of America, which rises in the Rocky Mountains, in the territory of Wyoming, flows first north through the Yellowstone Lake into Montana, afterwards north-east, and, after a course of about 1300 miles, joins the Missouri, of which it is the largest affluent, on the boundary between Montana and Dakota. At about 15 miles below its exit from the lake the river falls in two magnificent cascades, respectively 110 and 397 feet; and shortly afterwards rushes through a mighty rent in the mountains, 20 miles long and of vast depth, in some places over 2000 feet.

**YEMEN**, a vilayet of the Turkish Empire, the south-eastern province or district of the peninsula of Arabia, bounded on the N. by Hedjaz and Nedjed, on the E. by Hadramaut and the Great Arabian Desert, on the W. by the Red Sea, and on the S. by the Gulf of Aden. Its ancient name was *Arabia Felix*, "Felix" being the erroneous interpretation given to *Yemen* by Ptolemy. The Arabic word, however, simply means "right;" the land to the right of Mecca.

It has always been rich in myrrh, frankincense, and other odoriferous substances, the "sweets of Araby the Blest;" and these, in conjunction with coffee, dates, senna, ivory, wax, and goat-skin leather, are still its principal products. Its coffee, under the name of Mocha, enjoys the reputation of being the best that is cultivated in any part of the world.

Yemen consists of a central table-land, about 4000 feet above the sea-level, and enjoying a subtropical climate, bounded towards the sea by a range of lofty mountains, many of which attain an altitude of 8000 feet, and whose slopes and valleys are clothed with forests, interrupted by breadths of fertile pasturage.

Between the sea and the mountain chain runs a low sandy terrace, called the *Tekama*, varying in breadth from 10 to 30 miles. The coast is frequently rocky and romantic, and girdled by low coral reefs, whose openings form harbours of considerable extent and great security.

The principal ports are Mocha, **ADEN** (a British settlement very strongly fortified, commanding the entrance to the Red Sea, and not comprised within the Turkish territory), Hodeida, Shekr, and Abou Aish. The capital is Sanaa, which lies some leagues inland, and differs in no essential feature from other Arabian towns. Loheia, Zebud, and Damar are places of little importance.

After a prolonged contest the Turks were driven out of Yemen in the seventeenth century, and the country was long governed by several independent princes, of whom the most powerful was the imam of Sanaa.

**YEN**, the new unit of value and account in Japan, made by the monetary law of 1871, and very closely approximating to the dollar of the United States.

It is represented by both gold and silver coins. The gold yen weighs 1.666 gramme, .900 fine, and is therefore worth 5.17 francs, *i.e.* 4s. 1.17d. The silver yen weighs 29.956 grammes, .900 fine, and is worth at the average silver rate (15½ to 1 of gold) 5.39 francs, or 4s. 3d. sterling. As the United States dollar is divided into cents and mills, so also is the yen divided into sen (1-100th) and rin (1-1000th).

**YENIK'ALE, STRAIT OF**, sometimes called *Strait of Kerch*, a narrow passage, about 22 miles long, and from 2 to 3 miles wide, connecting the Black Sea with the Sea of Azov, and bounded by the lofty heights of the Caucasus on the east, and the rugged cliff of the Crimea on the west.

**YENISEI**, a large river of Sib'ria, situated between the Obi and Lena. It is formed by numerous streams just within Mongolia, which rise on a plateau of the Altai range, between the Tangnu Ola and the Sayansk Mountains; flows almost due north through Siberia, and enters the Arctic Ocean by a large estuary, after a course of above 3000 miles. Its basin is estimated at 1,000,000 square miles. It is very deep, abounds with fish, and is navigable throughout almost its whole extent, but is completely ice-bound for a great part of the year. Its principal tributary is the Angara, which flows from Lake Baikal, and is considerably longer than the Upper Yenisei, and should therefore more properly be considered the main stream. Its estuary is about 270 miles in length, and contains numerous islands.

**YEO'MAN, YEOMANRY CAVALRY**. Of the various derivations proposed for the word yeoman perhaps *gemein*, or common, is the most probable. A yeoman is at the head of the classes beneath gentlemen. There is a bodyguard called the yeoman of the king's guard, established by Henry VII. It consists of 100 men, habited in the costume of the sixteenth century, and commanded by a captain and other officers.

During the long war consequent on the French Revolution, and while this country was threatened with invasion, there was embodied in almost every county a mounted force under the name of Yeomanry Cavalry. There was also a large force of Infantry Yeomanry, but after the peace of 1814 these were disbanded, as were also many of the cavalry. The number of yeomanry provided for in the army estimates for 1887-88 was 14,405, and the annual cost of the force is about £76,000. The horses and uniforms are provided by the men themselves, who receive annually a clothing and contingent allowance of £2 per man, and during the yearly training 2s. a day for forage, and a subsistence allowance of 7s. a day. By the Mutiny Act they may be embodied for service in any part of Great Britain, in which case they would receive cavalry pay, with forage allowance. Unlike the ordinary volunteers, the yeo-



may be called out in aid of the civil power in cases of riot, &c.

**YEOVIL**, a town and municipal borough of England, in the county of Somerset, situated near the borders of Dorsetshire, 123 miles from London, with which it is connected by two main lines of railway—the Great Western and the London and South-western—and 26 miles east by south from Taunton, stands on a hillside sloping to the river Yeo. It consists of a number of streets irregularly laid out; but some of them are spacious, and have good houses of brick or stone. The parish church is a handsome building of Perpendicular character, with a large plain western tower 90 feet high. From the height of the side aisles and largeness of the windows it has been called the "Lantern of the West." Trinity Church, an early English structure, was erected in 1816. There are also places of worship for nearly every denomination of dissenters. The principal manufactures are those of kid gloves and sail-cloth, and some brewing. The municipality consists of four aldermen and twelve councillors, including the mayor. The population of the burgh in 1881 was 8480; of the parish, 9507.

**YES.** See YEA.

**YEW** (*Taxus*) is a genus of plants, the type of a tribe, *Taxææ*, of the order *CONIFERÆ*. The genus *Taxus* is distinguished by having the female flowers solitary on terminal shoots, each consisting of a naked, erect ovule, sessile on a disc, which latter becomes fleshy when ripe, and forms an open cup, red and succulent, surrounding the nut-like brown seed; the male flowers are disposed in catkins, and consist of anthers on short stalks, protected by membranous scales; the male and female flowers are found on separate trees (dioecious); the embryo has two opposite cotyledons.

The Common Yew (*Taxus baccata*) is a native of most of the temperate parts of Europe and Asia. It is an evergreen tree, usually between 30 and 40 feet high, with a massive trunk and numerous branches, spreading horizontally from a height of a few feet from the ground, and forming a dense head. The leaves are crowded on two opposite sides of the branches, and are simple, linear, dark green, shining above and paler below. The flowers are whitish, and appear in March and April. The fruit is ripe in September. It is red and succulent externally, and the pulp has a sickly sweetish taste, and is not unwholesome, being eaten by children, birds, wasps, and caterpillars. The seed is said to be poisonous. The leaves are poisonous to cows and horses; upon the human subject they produce an effect similar to that of digitalis, but their use medicinally requires great caution.

The yew is found growing generally in shady situations in heavy soils, seldom in company with its own species, but alone, or with other species of plants. It is of slow growth, attaining under favourable circumstances a height of 6 or 8 feet in ten years, and 15 in twenty years. The tallest yew in England is in the churchyard at Harlington, near Hounslow, which is 60 feet high. A tree continues growing for about 100 years; it mostly ceases to grow at that age, but will live for many centuries. The yew trees at Fountain's Abbey are supposed to have attained their full growth in 1132.

The yew appears to have been employed from the earliest times in the manufacture of bows, and was used for this purpose by the English previous to the introduction of gunpowder. There are many allusions among English poets to this use of its wood. It is now employed in cabinet-making. It is very hard, compact, and of a fine close grain, which arises from the smallness of its annual rings, 280 being sometimes found in a piece not more than 20 inches in diameter. It takes a high polish, splits readily, and is elastic and incorruptible. It is also adopted by the turner for making snuff-boxes, musical

instruments, &c. The heart-wood is of a fine orange red or deep brown, and the sap-wood is white.

The yew is also planted for hedges, and during the seventeenth century was a favourite in topiary gardening. It is propagated chiefly by seeds, but also by cuttings or layers, and grows in any rather moist soil. The Irish Yew, sometimes considered a distinct species under the name *Taxus fastigiata*, is a well-marked variety, distinguished by its upright growth and scattered leaves. It was originally discovered wild in Ireland. The North American Yew (*Taxus canadensis*), found in Canada and the United States, is chiefly distinguished by its smaller size, and is probably only a variety of the common species.

**YEZO** is the chief residence of the Persian Fire Worshipers, where the sacred fire has been burning for 3000 years without a moment's interruption on the mountain called the Mansion of the Fire (*Ater Qudrah*). It is the great desire of every one of the sect to die if possible upon this holy mountain.

**YEZO, YES'O, or JES'SO**, the most northerly of the four principal islands of Japan, separated from the chief island of Hon-do by the Strait of Sangar. It consists of a tolerably compact centre and numerous remarkable peninsulas, and has a mountainous interior, with numerous volcanic summits. There are several fine rivers, and the shores are indented with excellent bays and harbours. The island is thickly wooded, and is rich in minerals, coal and sulphur being abundant. The indigenous inhabitants, called *Ainos*, are a well-grown race, possessing good features and abundant coarse black hair, covering nearly the whole body. Their character is well spoken of. The government of the island, of which the Japanese took possession in consequence of the occupation of Saghalien by the Russians, is in the hands of a distinct office called the Yezo Colonization Department. Hakodadi, near the south end of the island, is the chief town. The area is said to be about 35,600 square miles, and the population about 124,000.

**YGDRAASIL**, in the Norse mythology, is the enormous ash-tree which binds together heaven, earth, and the under world. Its roots are triple, one runs towards the world of men (Midgard), another to that of the frost giants (Hrimthurser), the third to the under world; the boughs reach to heaven, and the topmost one overshadows Walhalla. It is evergreen, for the Norns daily water it with sacred water. But the dragon Nidhöggn perpetually gnaws at it, and it will eventually wither, though not till the last battle has been fought and the world all changed at RAGNAROK.

**YMIR or ORGELMIR**, the violent clay-giant who first of all things came to life, according to the Norse mythology, for the first rays of the sun played upon the icy world, and, as it melted, revealed his form. Next appeared the cow Andumlar, from whom flowed four rivers of milk that fed Ymir and his children, the Hrimthurser. The cow licked the salt ice-rocks, and thus freed Buri, whose three grandsons, the Ases, Wotan, Will, and We, made war on the turbulent mad Ymir, slew him, and threw his body into the chasin called Ginungagap. His blood flowed over all the land, so that his own children were drowned, all save one, who became parent of the later race of Hrimthurser. This was Bergelmir. The Ases made the earth of Ymir's body, the sea of his sweat, the hills of his bones, the trees of his curly hair, the sky of his skull, and the clouds of his brains. Finally, they made Midgard, the habitable earth, out of his eyebrows.

**YOGA**, i.e. *Concentration* or religious contemplation (*Sans. yuj*, to join), is that part of the Sankhya philosophy of India which teaches how the human soul may become permanently united with the Supreme Being. In fact, it is a system closely similar to the famous *ecstasy* of the Neo-platonist philosopher PLOTINOS. The yogin has eight

ways or stages of arriving at his ecstasy—forbearance, religious observance, postures, regulation of the breath, restraint of the senses, steadying of the mind, contemplation, and profound meditation. Many postures are given, with minute directions, which the yogin is to take up, and while keeping the posture unaltered is to meditate upon the word *Om*, the most glorious appellation of the Supreme Being. Regulation of the breath is very efficacious, inhaling through the left nostril for seven and a half seconds, then holding the breath for thirty and a half seconds, then exhaling through the right nostril for fifteen seconds, &c. Restraint of the senses, i.e. the power of withholding them from their operation, is a yet more refined method in the Yoga. But the steadying of the mind, a still further stage, is best attained either by holding the breath for twenty-one minutes thirty-six seconds, or by repeating the holy name *Om* 144,000 times, or by fixing the eyes on the tip of the nose for two hours. The adept at the seventh stage can hold his breath for forty-three minutes twelve seconds, which does not seem credible; but what is one to say of the last stage, when the breath is to be held for one hour twenty-six minutes and twenty-four seconds? The reward to the yogin is freedom from all infirmities; heat and cold, pleasure and pain are alike to him, prosperity and adversity can neither of them shake him. He will have knowledge of the future and of the past. He can become large and small, heavy and light at will.

It is perhaps unnecessary to add that the professional yogins are nearly always mere impostors, who live by amusing sceptics with their feats of endurance, and fleecing the credulous on the reputation of great sanctity. The practical part of the yoga was admitted into the later Vedas, and its ethical portion is dwelt on in the celebrated Bhagavad Gita.

**YOKOHA'MA**, a seaport in Japan, on the side of the Bay of Yeddo, opposite to Kanagawa. It was formerly a fishing village, but is now the chief port in the empire, and is the place of residence of most of the foreign traders. It is connected by railway with Tokio. The commerce is extensive and increasing; and among the public buildings are a large custom-house, quays, and warehouses, and some residences for the merchants; but the town is completely isolated from the interior by a deep canal. There is, however, a causeway across the marshy ground connecting it with Kanagawa. Constant improvements in the harbour accommodation and in the arrangements of the town are going on. The population is about 65,000.

**YONNE**, a department in the north-east of France, which formed part of the old province of Burgundy, is bounded N. by Seine-et-Marne and Aube, E. by Aube and Côte d'Or, S. by Nièvre, and W. by Loiret. Its greatest length from north-west to south-east is 82 miles; its greatest breadth, 53 miles. The area is 2868 square miles; and the population in 1886 was 355,364.

*Surface, Rivers, &c.*—The department has an undulating surface with rich pasture lands; the highest ground is toward the south-western corner, where the hilly district of Puisaye separates the basin of the Loire from that of the Seine. The hills are sometimes barren, but they are usually covered with fruitful vineyards. The climate is temperate, and the air pure and healthy, except in some marshy spots in the west, where fever often prevails. Iron ore is obtained; freestone, sandstone, and lithographic stone are quarried; red and yellow ochre are also met with. Roman roads and encampments are seen in several places.

The department is drained chiefly by the river from which it is named, and its affluents. The Yonne rises in the department of Nièvre, near Château-Chinon, and flows N.N.W. past Coulanges, Auxerre, Joigny, and Sens, a few miles below which it turns west, and enters the department of Seine-et-Marne, where it joins the Seine at Montereau. Its whole course is about 150 miles. The river is navigable

from Auxerre, about 70 miles above its mouth. Great quantities of squared timber and firewood are floated down the Yonne and its feeders for the supply of Paris.

There are two navigable canals in the department: the Canal de Bourgogne or Canal de l'Est, which connects the river system of the Seine with that of the Rhone [see *COTE D'OR*]; and the Canal-du-Nivernais, which leaves the Loire at Decize, in the department of Nièvre, and enters the Yonne at Auxerre. The department is also traversed by the railway from Paris to Lyons, which passes through Sens, Joigny, and Tonnerre.

*Products.*—Yonne produces much corn and wine. The latter is mostly of excellent quality, and is known by the general designation of Lower Burgundy wine. There are extensive forests, inhabited by deer and wild bears; badgers are also met with. The manufactures comprise iron, coarse cottons and woollens, blankets, serges, casks, conserve of grapes, beet-root sugar, leather, glass, tiles, and pottery.

The department is divided into the five arrondissements of Auxerre, Avallon, Joigny, Sens, and Tonnerre.

The capital of the arrondissement of Auxerre, and of the whole department, is **AUXERRE**.

**YORE DALE ROCKS**, a series of hard sandstones, shales, and thin bedded limestones, occurring in Central England, between the carboniferous limestone and the millstone grit. [See *CARBONIFEROUS PERIOD*.] They were so named by Professor Phillips, from their typical development in Yoredale, Yorkshire, where they attain a thickness of from 800 to 1000 feet. They constitute "passage beds" between the two great divisions of the carboniferous strata in the midst of which they are placed, and contain numerous fossils—marine, fresh-water, and terrestrial. Beds of **CHERT** occur which have been shown to consist almost exclusively of myriads of sponge-spicules (see the *Geological Magazine*, October, 1887).

**YORK** (England). See under **YORKSHIRE**.

**YORK**, a town of the United States, in Pennsylvania, 22 miles south-east of Harrisburg. There are several large manufactories, but it is chiefly of importance as the market-town for the surrounding agricultural district. It was founded in 1740 by Lutherans from Wurtemberg, and the German element preponderates. In the neighbourhood are medicinal sulphur springs. The population in 1880 was 13,940.

**YORK, HOUSE OF.** The title of Duke of York has never been conferred except on a son, uncle, or brother of the reigning monarch. The first Duke of York was Edward Plantagenet, surnamed *De Langley*, from the place of his birth, who was the fifth son of Edward II., and was created Earl of Cambridge by his father in 1362, and was afterwards, in 1385, made Duke of York by his nephew, Richard II. He was a nobleman of great abilities, and attained the highest reputation both in the cabinet and the field. He strove earnestly, but in vain, to sustain his weak and worthless nephew Richard upon the throne, and on the accession of Henry IV. retired to his seat at Langley, where he died in 1402. Shakespeare has put into the mouth of this duke his striking description of the entry into London of the disrowned King Richard and Bolingbroke. The duke married Isabel, daughter and co-heir of Peter king of Castile and Leon, and was succeeded by his eldest son, Edward, second duke of York, who had been created Duke of Aumerle in 1397, but was deprived of this dukedom by the first Parliament of Henry IV., though he was suffered to retain his earldom of Rutland. (See Shakespeare's "*Richard II.*," Act v.) He, too, was an eminent warrior, and fell at the battle of Agincourt in 1415. As he left no issue the dukedom of York devolved upon his nephew, Richard Plantagenet, earl of Cambridge, who became one of the most powerful subjects in the kingdom, and ultimately laid claim to the throne. His pre-

tensions were founded on his descent through his mother from Lionel duke of Clarence, third son of Edward III., whose granddaughter she was, while the reigning monarch, Henry VI., was descended from John of Gaunt, duke of Lancaster, fourth son of Edward. The duke's claim to the crown, which gave rise to the devastating Wars of the Roses, was first asserted about 1450, after the rebellion of Jack Cade. Hostilities between the adherents of the red and white roses began in 1455, and for many years deluged England with blood. The claims of the Duke of York were supported by the Earl of Warwick, the famous "king-maker," and by other powerful nobles; and the victories gained by them at St. Albans (May, 1455) and Northampton (July, 1459) put them in possession of the person of King Henry, and seemed to have secured the crown to the duke. But the tide speedily turned, and on the 30th December, 1460, the Yorkists were defeated by Queen Margaret in the bloody battle of Wakefield, and York himself was slain. His titles and estates were inherited by his eldest son, Edward, fourth duke, who ascended the throne as Edward IV. in March the following year. The title of Duke of York was next conferred upon Richard Plantagenet, the second son of that king, who was murdered in the Tower along with his elder brother, Edward V., in 1483. It was subsequently borne by Henry Tudor, second son of Henry VII., who was created Duke of York in 1491, and who, on the death of his elder brother Arthur in 1503, became Prince of Wales, and ascended the throne as Henry VIII. in 1509; by Charles Stuart, second son of James I., upon whom it was conferred in 1601, and who became Duke of Cornwall on the death of his elder brother Henry in 1612, was created Prince of Wales in 1616, and succeeded to the crown as Charles I. in 1625; by James Stuart, second son of Charles I., upon whom it was conferred in 1613, and who ascended the throne as James II. in 1685; by Ernest Augustus, fifth brother of George I., who was created Duke of York and Albany in 1716, and died without issue in 1728; and by Edward Augustus, second son of Frederick prince of Wales and brother of George III., who was created Duke of York and Albany in 1760, and died without issue in 1767. The last wearer of this celebrated but ill-famed title was—

FREDERICK, second son of George III. and Queen Charlotte, who was born on the 16th of August, 1763. Seven months after his birth he was nominated by his father, as Elector of Hanover and Duke of Lunenburg, to the bishopric of Osnaburg, one of those secular dignities, with an ecclesiastical jurisdiction, which are peculiar to Germany. In 1784 he was created Duke of York and Albany in Great Britain, and Earl of Ulster in Ireland. In 1793, in spite of his inexperience and utter want of military talent, his indolence, and confirmed habits of gambling and drinking, he was appointed to the command of the British contingent in the allied army which, under the Prince of Saxe-Coburg, was sent to defend Holland against the invasion of the French; but, eventually, the French army under Pichegru defeated the allies near Tournay on the 14th of May, 1794, and on the 18th the Duke of York's division was attacked and completely routed. Upon the receipt of this grave intelligence, and private accounts of the duke's incompetency, the duke was immediately recalled. The king gave a reluctant consent to this step, but on the return of his royal highness his majesty immediately created him a field-marshal, and appointed him commander-in-chief of all the forces of the United Kingdom. In 1799 the Duke of York once more returned to active service, and was actually permitted to assume the command of the expedition to Holland; but though commanding 41,000 men, in less than four weeks he found it necessary to treat with the enemy, who had only 30,000, for permission to retreat. The administration

of his royal highness at the Horse Guards was not greatly superior to his services in the field. In 1809 the revelations arising out of the connection of his royal highness with the notorious Mrs. Clarke, rendered it impossible any longer to conceal from the public his weakness and profligacy, and the corrupt practices which he had connived at in the disposal of commissions. He was, in consequence, obliged to resign his office. On the establishment of the regency, however, the Prince of Wales reappointed his brother to the office of commander-in-chief, which he continued to hold till his death, 5th January, 1827. He died deeply involved in debt, occasioned by his dissolute habits, and especially by his passion for gambling, and many of his unfortunate creditors were utterly ruined. The duke left no issue by his duchess, who died in 1820, and his titles expired with him. His statue is at the top of the column at the entrance to St. James's Park, placed up there, as the epigram says, to be out of the way of his creditors.

**YORKSHIRE**, a maritime county in the northern part of England, is bounded N.E. and E. by the North Sea; S. by the estuary of the Humber and the river Trent, which separates it from Lincolnshire, Nottinghamshire, and Derbyshire; S.W. by a small part of Cheshire; W. by Lancashire; N.W. by Westmorland; and N. by the river Tees, which divides it from Durham. The greatest length east to west is about 100 miles; the greatest width north to south is about 92 miles. It is as large as any other two counties in great Britain; about the size of the entire Peloponnesus; very nearly half as large as modern Belgium; and half as large as Holland. The population in 1881 was 2,886,561, and the area 3,882,851 acres.

**Coast.**—From the mouth of the Tees to Flamborough Head the coast of Yorkshire, which is the boldest and finest in England, with the exception of that of Devon and Cornwall, extends E.S.E. and south east, and is generally high and precipitous. The distance, following the sweep of the sea-line, is about 60 miles, and the only harbour of importance is that of Whitby. Huntecliff Nab is a bold headland, 360 feet high; Boulby Cliff, 660 feet, the loftiest precipice on the English coast. South of Whitby lies Robin Hood Bay, a locality of singularly picturesque character, terminated by a high peak, 585 feet above the sea. The scenery near Scarborough is scarcely less romantic, and the grand curve of Filey Bay possesses great attractions for the artist. From Flamborough Head, which is a lofty cliff of chalk protruding far into the sea, and tunnelled by some splendid caverns, the coast turns to the west, and sweeping round to the S.S.E. forms Bridlington Bay, in which is the small harbour of Bridlington Quay. The sands are here very firm and level. The coast, then, with a few cliffs at intervals, decreases in elevation as it extends to Spurn Head, which terminates on the east the alluvial district of Holderness. Dimlington Hill, 146 feet, is the highest point between Flamborough and Spurn Head. It is said that a gradual recession of the Yorkshire coast is going on, owing to the encroachments of the sea. The average annual loss of land has been calculated at 2½ yards, a rate which would obviously cause serious loss to the county in course of time. It is unquestionable that several waterside villages have suffered from the inroads of the sea—Kilnsea, for instance, which lost its church from this reason in 1826; but it is not yet clear that the annual loss is so great as that mentioned.

**Surface.**—The most striking feature in the conformation of the surface of Yorkshire is the great valley drained by the Ouse and its tributaries—the Ouse, and the Trent from Lincolnshire, forming the estuary of the Humber. If through the city of York a line be drawn to the N.N.W. and S.S.E., it will divide equally a wide continuous vale, rarely elevated more than 100 feet above the sea. Were the general level of the land lowered to this extent, this

vale would form a sea-channel, bordered by the cliffs of an island on the east, and more slowly rising shores on the west. The district assumes a somewhat mountainous character along nearly all the western border of Yorkshire. The eastern region is also mountainous in its northern portion, and in the southern rises into a curved range of chalk hills called the Wolds. These consist of an insulated range of chalk, which extends in the form of a crescent more than 30 miles, from Flamborough Head almost to the banks of the Humber, about 8 or 10 miles above Hull, separating the basin of the Hull from that of the Derwent. Many feeders of these rivers rise on the southern slope; those of the Hull on the concave side of the crescent, those of the Derwent on the convex, while the northern part of the Wolds is drained by a stream which falls into the sea at Bridlington Quay.

North of Flamborough Head the basin of the Humber extends to the east, for the source of the Hartford, an affluent of the Derwent, is as near the shore at Filey Bay as that of the Hull at Bridlington, nor is the head of the Derwent itself more than 2 or 3 miles distant from Robin Hood Bay, which forms the north-eastern extremity of the basin.

The Oolitic hills extending from Robin Hood Bay inland, under the designation of the Eastern Moorlands, form part of the northern boundary of the basin of the Ouse and Humber, and separate it from that of the Esk, which falls into the sea at Whitby, and from that of the Tees, which divides Yorkshire from Durham. The Eastern Moorlands are a wild and extensive tract, about 20 miles long and 14 miles wide, the surface of the more elevated parts being covered with large freestones, extensive morasses, and peat bogs. They are also clothed in many places with thick deep heather, and the moorland ridges are divided by long winding dales, each watered by its own bright brook and marked by a long line of rich green pasture. The most important of these are Bilsdale, Bransdale, Farnedale, Rhosdale, and Newtondale. Their leading features have been graphically described by Charlotte Brontë in her novel of "Shirley." Some of the mountains are nearly 2000 feet high. A branch of the Eastern Moorlands, extending in a south-east direction from the western extremity of the range, divides the basin of the Derwent from that of the Swale and the Ouse.

From the western end of the Eastern Moorlands the basin of the Ouse is bounded, still on the north side, by a lateral branch or offset of the great Pennine chain, which separates this basin from those of the Tees and the Eden. The hills constituting it rise above the valley which divides them from the Eastern Moorlands near Great Smeaton, between Northallerton and Darlington, and extend westward, increasing in height as they proceed to their junction with the main Pennine chain near the mountain called the Nine Standards, in Westmorland. That part of the range which occupies the north-western extremity of the West Riding forms the western portion of the wild district of Craven, and comprises, among its more elevated summits, Ingleborough, or "the bill of the Angles" (2373 feet high), and Penygaunt (2273 feet high).

The north-western section of the basin of the Ouse is formed by the Pennine Mountains, which separate it from the basins of the Eden, as well as from those of the Lancashire rivers, the Lune, the Ribble, and the Mersey. The branches which the great chain throws off towards the east, constituting the Western Moorlands, containing some of the most picturesque dales and finest rock scenery in England, are separated from each other by long, narrow, but romantic valleys, in which the Swale, the Ure, the Wharfe, the Aire, the Calder, and the Don, all directly or indirectly tributaries of the Ouse, have their course. This district is remarkable for the wild grandeur of its landscapes. The neighbourhood of Rokeby has been painted

with equal force and truth by Sir Walter Scott; and the district of Richmond, Wensleydale, Garsdale, Niddersdale, Upper and Lower Wharfedale, Bolton Priory, Settle, Ribblesdale, Ingleton, and Craven, with their stalactite caves and leaping waterfalls, their heather-clad hills and bold rocky scours, are not less worthy of song and pencil. The southern end of the Pennine chain forms for many miles the boundary between Yorkshire and Derbyshire. The general elevation of the Western is greater than that of the Eastern Moorlands, the mountains, as they advance towards the great Pennine ridge, attaining an elevation of 2500 to 2600 feet.

The valley of the Ouse, or the Vale of York, whose eastern and western boundaries have already been described commences very near the river Tees, and, occupying the centre of the county, extends south and south-east to the Humber. Its highest elevation is about 100 feet above the sea. The northern section has a gentle slope, with the level broken by several bold swells; but south of the city of York the surface sinks into a perfect flat, and is in several districts marshy, especially along the course of the Ouse. That portion of the valley spreading immediately about the lower part of this river, and lying between it and the Wolds which separate the valley from the Holderness district, is called the Levels; and though fertile and pretty thickly inhabited it presents no interesting features. Further south, towards Sheffield, and on the western slope, the surface is finely diversified by the green hills which gradually rise towards the mountainous district.

*Geology.*—The great central vale of Yorkshire consists for the most part of extensive breadths of fine sediments, accumulations of gravel, and other diluvial deposits.

The Wolds are composed of chalk, which is usually a harder rock than that of the south of England, and the nodular flints that it contains are scattered through a great part of its thickness. It is rich in sponges, belemnites, echidna, apiserinites, and marsupites. The lower sandstone, shale, and coal constitute the Eastern Moorlands. The latter, in this great mass of arenaceous and argillaceous deposits, is thick enough to be worked on the moors west of Whitby and north of Helmsley. Over the coal lies a bed of sandstone, and below it one of shale. Upper lias shale, called also alum shale, is manufactured into alum near Whitby, Lofthouse, and Gainsborough; it is found in considerable quantities in the Whitby cliffs. The new red sandstone, which lies on the western side of the vale of York, in an irregularly undulating tract of dry land, accumulates especially about Ripon and Borough-bridge. The magnesian limestone extends in a range of low tabular hills from near Masham, by Knaresborough, Pontefract, Broadsworth, and Roche Abbey. The lower red sandstone, or Pontefract rock, is usually a mass of yellowish sands, of the greatest excellence for the use of the metal founder in the construction of his moulds.

From beneath the southern part of the nearly straight edge of the magnesian deposits rise the sandstones, shales, ironstones, and coal of the West Riding of Yorkshire, filling an enormous space in the valleys of the Aire, Calder, Went, Dearn, Dove, and Don. The whole of this large area (not less than 600 square miles) yields coal. The series of strata is about 4000 feet thick; and of the coal which lies in it there are about twenty workable beds, yielding some 40 feet of the mineral, generally of good quality. The seams are worked in the west of Yorkshire as thin as 18 inches (near Halifax and Penistone), and one as thick as 8, 9, or 10 feet (Barnsley), but the average is from 3 to 6 feet.

The ironstones of the coal-measures have been worked from a very ancient period. They are found in the greatest abundance in the Cleveland Hills, and form what has been called the "new iron-fields of England." Numerous smelting houses have been erected on both sides of the Tees,

and Middlesbrough has risen into repute as the metropolis of the trade.

The millstone grit surrounds the coal-field on the west and north sides from Sheffield, by Huddersfield, Keighley, and Otley, to Harwood. It spreads to the boundary of the county, rising in the mountainous border of Lancashire, and occupying, along the confines of Westmorland and Cumberland, the summits of all the great ridges about the sources and between the valleys of the Ribble, Wharfe, Nidd, Swale, Greta, and Tees. It constitutes most of the high heathy moors of these districts, and contributes much both to their barrenness and their picturesque effect. The most characteristic rock is the quartzose conglomerate, used in making millstones. The whole series is about 1000 feet thick. The mountain limestone, of nearly the same depth, consists of five principal bands, alternating with grit-stones, shales, thin coals, and some ironstone nodules. It crops up in many of the magnificent mural precipices which surround the great mountains, Ingleborough, Penzance, Pen Hill, and Micklefell.

*Climate.*—The great extent of the county, and its consequent variety of surface, occasion very considerable differences in the climate of different districts. That of the coast is, from its situation, cold and bleak; but in some of the vales opening inland, which are sheltered from the westerly winds and from the sea air, the temperature is comparatively mild. The Eastern and Western Moorlands are necessarily raw and ungenial from their exposure and elevation. On the Wolds the cold is less severe, and the soil dry and warm.

*Rivers.*—The greater number of the rivers of Yorkshire are affluents of the Ouse, which is formed by the confluence of the Swale and the Ure. The former rises near the Nine Standards on the border of Westmorland, and the Ure about 10 miles further south. The two rivers, both of which are rapid, flow in a general easterly direction inclining to south, and unite below Boroughbridge. Their stream is then named the Ouse, but more frequently the Ure, or Yore, till it reaches York: whence, flowing south and east through the Vale of York, it proceeds to meet the Trent, and combines with it to form the Humber.

About 8 miles above York the Ure receives the Nidd, a swift stream winding through a valley of great beauty, which rises about 14 miles north-west from Pateley Bridge. The principal affluents of the Ouse are the Wharfe and the Aire. The former, a rapid stream, the "Swift Wharf" of Spenser, rises a short distance south from the source of the Nidd, west of Pateley Bridge, and flowing east past the Weatherby, falls into the Ouse at Cawood. Traversing Bolton Woods, it becomes hemmed in between ledges of rock, stained with lichens, and festooned with canopies of linnæ, and forms a noisy and boiling rapid, named "The Strid," which has been immortalized by the poet Wordsworth. The Aire, a large river, rises not far from Settle, and at no great distance from the source of the Lancashire Ribble, and flowing south-east and east joins the Ouse near Howden. Its upper course, especially at Cordale Scar and Malham Cove, 300 feet high, is of a romantic character. Its principal affluents are the Calder and the Don. The former rises in the vicinity of Burnley on the borders of Lancashire, and flowing east to Wakefield, with many windings, joins the Aire near Ferrybridge. The Don is not a rapid river. It rises north-west from Sheffield, and passing that great commercial and manufacturing depot, and Rotherham, where it receives the Rother, turns north-east, and strikes past Doncaster, to join the Ouse at Goole. The Ouse itself is a slow and somewhat muddy river. Its course from York, following all the windings, may be about 35 miles. The total length, from the source of either the Swale or the Ure, is about 130 miles.

The Humber, which may be described as the grand basin and receptacle of all these rivers, forms, together with the

Trent from Lincolnshire, a wide estuary, of the greatest commercial importance. It receives on the north bank the Derwent and the small river Hull.

*Canals.*—The canals which intersect Yorkshire are numerous. The Aire and Calder Navigation, 15 miles long, forms a connection between the Ouse and Humber, the Leeds and Liverpool (129 miles long), the Barnsley, and several other smaller canals. The other principal water-ways of the West Riding are the Dearm and Dove, the Stainforth and Keadby, and the Huddersfield canals. The latter engineering work is 20 miles in length, and rises between Huddersfield and Marsden, by forty-two locks, to the height of 656 feet. It then passes under the Standedge range of hills by a tunnel upwards of 3 miles in length. In the North and East Ridings occur the Foss Navigation, the Market Weighton, and a canal from Great Driffield to Hull.

*Soils and Agriculture.*—The soil of the North Riding is generally a brownish clay and loam. The Vale of Cleveland, on the west side of the Eastern Moorlands, has a fine red sand and some fertile clays. Swaledale, on both sides of the Swale, is extremely productive. The Vale of York is a pastoral district, in good repute for its agricultural facilities. The soils of the West Riding vary from a deep strong clay to the worst peat earth. In the East Riding the Wolds are chiefly used for sheep pasturage. The soil is a light loam, with a mixture of gravel. In the flat district of Holderness occurs a strong alluvial deposit. The agriculture is generally of an improved description.

*Manufactures.*—The manufactures of Yorkshire are of national importance. Those of woollen cloths, at Leeds, Bradford, Halifax, Wakefield, and Huddersfield, have been brought to such a degree of perfection as to surpass the woollens of the West of England. The making of worsted fabrics was introduced into the county about the middle of the seventeenth century, and Bradford is now the great worsted mart of England. The ironworks are very extensive. Sheffield is the great seat of the manufacture of cutlery of all kinds, as well as of tools and plated goods. Linens are extensively produced at Leeds and Barnsley, blanketings at Dewsbury, cottons in the Todmorden Valley, and glass and iron at Rotherham. The resources of the county also include lead mines in Swaledale and Niddale; jet, which is worked extensively at Whitby; alum, building stones, and black and gray marble. Hull, Whitby, and Goole are the chief ports.

Yorkshire is divided into three Ridings—the East, West, and North, each of which is treated administratively as a separate county. The county is further divided into twenty-six wapentakes. For parliamentary purposes it is divided into twenty-six divisions, each returning one member.

*History.*—The early inhabitants of the county were included by the Romans under the general name of *Brigantes* (a word which has been explained as signifying highlanders or mountaineers). They were not subdued until A.D. 78-79, when the work of conquest, begun by Ptilinus Cerealis, was completed by Agricola. Their territory was quickly covered with camps, and cities, and roads, and under the name of Valentia attained a remarkable condition of prosperity. York, *Altera Roma*, was the imperial residence when Britain was visited by the emperors, and the headquarters of the sixth legion, who thence despatched the troops necessary to garrison the advanced posts and the stations along the Great Wall.

When and how Valentia was converted into an Anglo-Saxon kingdom it is difficult to determine. We read of Ida as its sovereign in 547, and nearly a century later find Yorkshire the seat of the principality of Deira, extending from the Humber to the Tyne. York in 620 became the capital of the powerful kingdom of Northumbria. In the reign of Edwin Christianity was introduced by the missionary, St. Paulinus. The Northumbrians increased in

wealth and civilization for upwards of a century and a half, until the Danes (in 793) made their appearance on the Yorkshire coast, and commenced those terrible incursions which retarded the national progress for many generations. In 875, under the great "viking" Halfdan, they established permanent colonies in Yorkshire, whose sites may still be recognized by the termination "by," or prefix "kirk," in the local names. Of the latter nineteen instances occur in the county.

The Danish kingdom of Northumbria was formed into an earldom by Canute or Cnut, whose rulers were among the wealthiest and most powerful of the English nobles. Tostig, the brother of Harold, was Earl of Northumbria under the Confessor. After the Conquest the country between the Humber and the Tyne became known by its present appellation, Yorkshire; it suffered terribly from the ravages committed by William and his soldiers in 1069-70, and for nine years was desolated by famine.

The county was afterward divided into fiefs, held by the famous Norman families of Percy, Lacy, Mowbray, Clifford, and Scrope, who founded churches and established monasteries, after their usual fashion. Rievaulx, the first Cistercian house, was established in 1131. St. Mary's, at York, the Benedictines had previously restored. It was the wealthiest abbey in Yorkshire: second in importance came Fountains (Cistercian); third, Selby (Benedictine); and fourth, Guisborough (Augustinian). York was created into a metropolitan see by Pope Gregory the Great. The first Norman archbishop was Thomas of Bayeux, consecrated in 1070. In the twelfth century the county was famous for the number of its rich monastic houses. The Cistercians counted nineteen; the Benedictines, sixteen; the Cluniacs, two; the Carthusians, two; the Augustinians, eleven; and other orders, thirty-five. The only mitred abbeys were those of Selby and St. Mary's, York.

After the Conquest, the principal events in the history of Yorkshire are necessarily connected very closely with the history of the kingdom, and their importance and interest prevent us from dwelling upon them.

We can but refer to the Battle of the Standard, near Northallerton, in 1138, in which the Scotch were totally defeated; the Scotch invasion, in 1322, under the Black Douglas; the insurrection against Edward II. in the same year; the landing of Bolingbroke (Henry IV.) at Ravenspurge; the rising of Archbishop Scrope and the northern earls, put down so cruelly and effectually by Henry IV.; and the great battles of Wakefield and Towton in the wars of the Roses, the latter of which crushed for ever the hopes of the Lancastrians. In 1536 occurred the religious outbreak known as the "Pilgrimage of Grace," and in 1569, the rebellion against Queen Elizabeth, generally entitled the "Rising of the North." During the Civil Wars the county was the theatre of frequent engagements between Royalists and Parliamentarians; its population, however, for the most part, sympathized with the royal cause, which here received its first deadly blow on the well-fought field of Marston Moor (2nd July, 1644), "one of the two bloodiest (the other was Towton) ever fought on English ground and between Englishmen." Yorkshire boasts of having possessed the two strongholds that held out last for Charles I.; Scarborough surrendered in December, 1648; and Pontefract, March, 1649.

*Antiquities.*—Almost every rood of ground in Yorkshire is rich in memorials of the past. These may be divided into British, Roman, Saxon, and mediæval. Of the British the most remarkable are the primitive houses and villages on Dunsby Moor, in Harwood Dale, at Egton Grange, and other localities. The Devil's Arrows, near Boroughbridge, are curious monuments of stone. There are camps at Almondbury and Mexborough; earthworks at Flamborough and Catterick. The most valuable Roman remains are the multangular tower at York, and the relics of the ancient

Surium (now Aldborough). A Roman bridge exists near Tadcaster (*Calcaria*).

Saxon architecture may be traced in the churches at Kirkdale, Hauxwall, Wensley, Ilkley, and Bedale; the finest Norman work at Campsall, Fislake, Selby, Goodmanham, Lastingham, Hornby, Leathley, Conistone. The later architectural styles are exemplified in many beautiful churches and remains of monastic buildings scattered over the entire county. To some of these we have alluded in the preceding pages.

We can only allude to the following castles and manor houses—Scarborough, Pickering, Danby, Gilling, Helmsley, Middleham, Snape, Tanfield, Skipton, Spofforth, and Barnard castles; Woodsome, Howsham, Bowling, and Ledsham halls; Burton Agnes and Burton Constable. Castle Howard and Duncombe Park were designed by Vanbrugh.

YORK, the capital of Yorkshire, a parliamentary and municipal borough, a county in itself, and the seat of an archbishopric, is situated on the river Ouse, at the junction of the three Ridings into which the county is divided, 191 miles north from London. It is an important railway terminus, being the meeting point of the Great Northern, Midland, and North-eastern systems. A fine station—one of the largest in the world—was opened in 1877. The city retains a venerable aspect. There are some manufactures of drugs and confectionery, combs, and carpenter's planes, glass works, flour mills, curriers, a good retail trade, and considerable benefit is derived from the influx of visitors attracted by the remarkable antiquities of the city and its annual races. It has numerous good hotels, very excellent and eminent schools and training institutions, a school of art, literary institution, Philosophical Society museum, a mansion house, guild-hall, concert room accommodating 2000, corporate board room, hospital, lunatic asylum, exhibition, and fine art institution, theatre, public baths, cattle and wool markets, and numerous local charities. Many of the public buildings and the bridges have special architectural and historical merits. The churches are very numerous, and with few exceptions exceedingly interesting. Many are very fine structures, though none are of any great size. There are numerous churches of the Establishment, Roman Catholic pro-cathedral, Wesleyan Methodist, Baptist, and other denominational chapels, many of which are important features in the ecclesiastical architecture of the city.

The special glory, however, of York is its cathedral, a structure of almost unrivalled grandeur and dignity. It was mostly built in the thirteenth and fourteenth centuries, is 524½ feet in length, and 222 feet in breadth internally, with a great tower, 231 feet in height, magnificent west front flanked by two towers, 196 feet in height, and richly adorned within. [See PLATES ENGLISH CATHEDRAL ARCHITECTURE, vol. v.] It has a splendid peal of twelve bells, and in the north-west tower a monster bell weighing 10 tons 15 cwt. The chapter-house is a building of rare beauty, and connected with the minster are some antiquities of great interest, and a library of 8000 volumes.

The remains of the ancient city walls are full of interest. They have been rebuilt and repaired at various periods. The five gates are called *Bars*.

On a tongue of land, formed by the junction of the Ouse and the Foss, stands the ancient castle (a county in itself), founded by William the Conqueror; besieged and captured by the Danes and Northumbrians in 1069; the scene of the terrible massacre of the Jews in 1190, when 500 perished in the keep; beleaguered by the Parliamentarians in 1644, and soon afterwards dismantled. It has ever since served as a prison.

St. Mary's Abbey was one of the earliest monastic establishments founded in Yorkshire after the Conquest. It belonged to the Benedictines, and accumulated great wealth. The remains of the monastic buildings are held

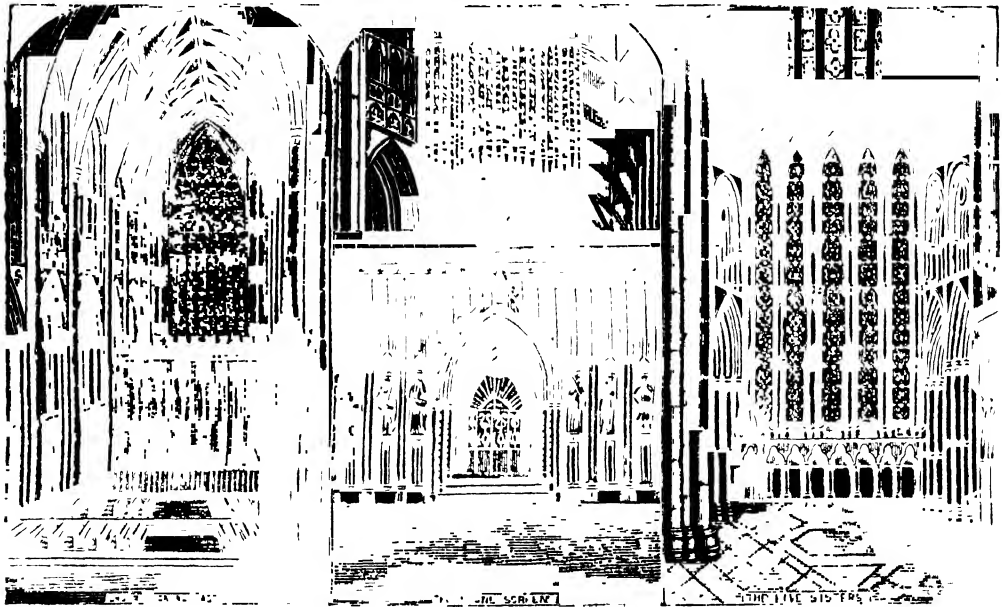


from the crown by the Yorkshire Philosophical Society, and are very carefully protected.

The corporation includes a lord mayor (the dignity having been conferred by Richard II.), and consists of twelve aldermen and thirty-six councillors. The population of the city, which returns two members to Parliament, in 1881 was 49,530. In 1881, however, the corporation obtained an extension of the municipal boundaries

of the city. The acreage is now 3558, and the population was estimated at about 70,000 in 1888.

York was the capital of the Brigantes, under the name of *Caer-Eboracum*. During the Roman occupation it was designated *Eboracum*, and several of the emperors resided in the city at different times, Severus dying here in 211. The celebrated Battle of the Standard took place outside the walls in 1138, when the inhabitants defeated the Scots,



Interior of York Minster.

the latter suffering a loss of 10,000 men. During the Civil War it suffered a siege of thirteen weeks from the Parliamentary forces under Fairfax, and was not taken until after his victory over Prince Rupert and the Royalists at Marston Moor.

The province of York owes its origin to Paulinus, the apostle of the North, who was the first archbishop; it formerly included the whole of Scotland, but is now confined to the six northern dioceses of England. The Archbishop of York, styled the Primate of England, is Lord High Almoner to the Queen. It was at York that, in 966, Egbert, first king of all England, held the witenagemot.

**YORKSHIRE FLAGS** are paving flags of excellent quality, largely used in the towns of the north of England, and chiefly obtained from quarries in the upper carboniferous strata in the neighbourhoods of Halifax, Bradford, and Rochdale, in Yorkshire.

**YORK TOWN**, an old village in Virginia, one of the United States of North America, 70 miles E.S.E. of Richmond, and 12 miles east of Williamsburg, is only interesting as being the place where, on the 19th October, 1781, the British army, under Lord Cornwallis, surrendered to General Washington, which event practically terminated the revolutionary war.

**YOSEMITE VALLEY**, a remarkably beautiful region in the United States, in California, situated on the western slope of the Sierra Nevada, 150 miles east of San Francisco. It is about 10 miles long and 2 wide, inclosed between precipitous cliffs of granite, from 2000 to 4000 feet high. The scenery is grand and beautiful, comprising several waterfalls. One of these is not less than 2600 feet, but divides into three parts, with one vertical fall of 1500 feet; others, though not so high, have a larger body of water. The sides of the valley, where they are less

abrupt, are finely wooded with pine and fir; and at its head there is a small lake, dominated by Mount Dana, which rises to a height of 13,227 feet above the sea. In the neighbourhood there are several other similar remarkable valleys and canons, though inferior in grandeur.

**YOUNGHAL**, a seaport town of Ireland, in the county of Cork, situated on the western shore of the estuary of the Blackwater, commonly called Younghal Bay. The town is very ancient; the houses are irregularly built, but generally of respectable appearance, though a few of the old houses are in a ruinous state. The nave and aisles of the church of an ancient collegiate establishment, founded in 1464 by the Earl of Desmond, have been fitted up as the parish church. Younghal formed part of the possessions of Sir Walter Raleigh, and the house in which he lived still remains, and has undergone little alteration. Here is also the garden where the potato was first planted and tobacco first smoked in Europe. Coarse earthenware and bricks are manufactured. The salmon fishery of the Blackwater is very extensive. The Roman Catholic chapel is a large and handsome structure, with a beautiful spire. There are chapels for Methodists, Independents, and Quakers; a court-house, union workhouse, infirmary, fever hospital, several almshouses, and numerous schools. The harbour is safe and commodious. The borough ceased to return a member to the House of Commons in 1885. The population in 1881 was 5396. The name is derived from *Eo-chaille*, the yew wood, which once existed in the neighbourhood.

**YOUNG, ARTHUR**, the agriculturist and agricultural writer, was a native of Suffolk, and born in 1741. He was a younger son of a prebendary of Canterbury. After a failure in farming in Essex, he is said to have resolved to travel over England in search of a suitable farm. In 1768



appeared the earliest of his agricultural works, "A Six Weeks' Tour through the Southern Counties of England and Wales," in which he noted what was good, bad, and peculiar in the agriculture of each district, and which, written with vivacity and enthusiasm, was successful itself, and the precursor of more books of home-tour from the pen of its author. For these and other works on agriculture he is said to have received, by 1775, £3000. The years 1776-79 he spent chiefly in Ireland—partly observing the country, partly superintending the estate of Lord Kingsbury in the county of Cork. The literary result of his Irish residence was his well-known "Tour in Ireland, with General Observations on the State of that Kingdom," published in 1790. Returning to England, he engaged anew in farming, and in 1786 commenced the publication of his "Annals of Agriculture," which he continued to publish until the year 1804. Young's reputation was now a European one, and King George III. himself contributed to the "Annals" under the pseudonym of "Ralph Robinson of Windsor." In 1787-89, Young explored France and its agriculture, publishing in 1792 his "Travels" in that country, "undertaken more particularly with the view of ascertaining the cultivation, wealth, resources, and national prosperity of the kingdom of France." From the period at which Young performed his tour, his work has a historical as well as an agricultural and economical value. In 1793 Young was appointed secretary of the board of agriculture. He died in 1820.

**YOUNG, BRIGHAM.** See MORMONS.

**YOUNG, EDWARD,** the famous poet of the "Night Thoughts," was born at Upham, in Hampshire, in 1681. His father was rector at Upham, and ultimately chaplain to King William, and dean of Salisbury. Edward was educated at Winchester School, and entered New College, Oxford, 13th October, 1703. He appears, however, to have given himself to the study of literature rather than law, though in 1714 he became B.C.L., and D.C.L. in 1719. He entered orders in 1727, and was named one of the royal chaplains; and in 1730 his college presented him to the rectory of Welwyn in Hertfordshire, where he spent the remainder of his life.

His earliest poem was the "Last Day," published in 1713. This, the "Force of Religion, or Vanquished Love," a play founded on the story of Lady Jane Grey, and his paucyric on Queen Anne at her death, are now deservedly forgotten. The tragedy of "Busiris" was brought on the stage in 1719, and was for a time successful; "Revenge" appeared in 1721, and "Brothers," another tragedy, in 1728. These dramas abound in poetic imagery, but the passion too often raves and rages under a forced inspiration, and the style is turgid and bombastic. Young's satires are of a higher order than his tragedies. The first part of the "Universal Passion" (the love of fame) was published in 1726, and the poem was finished in 1728. It was at once popular, and brought its author £3000. The satire is pungent and powerful—vivid and picturesque—abounding in witty exposures amounting almost to caricature. Several minor poetical pieces need not be noticed, such as his "Imperium Pelagi," which was ridiculed in Fielding's "Tom Thumb," his paraphrase of a part of Job, and his "Ode to the Ocean," &c. After his retirement to his rectory, he set himself in earnest to discharge his clerical duties. As might have been anticipated, his sermons were rich in thought and imagery, and striking in their illustrations, while his delivery was animated and solemn. In 1731 he married Lady Elizabeth Lee, widow of Colonel Lee and daughter of the Earl of Lichfield, and the union seems to have been a happy one. A series of afflictions now befell him, and he entered into that shadow which gave birth and grandeur to the "Night Thoughts." In 1736 a daughter of his wife by her former husband died at Lyons, and her dust, as that of a Pro-

testant, was refused interment. Four years afterwards her husband died. They are the Narcissa and Philander of the poem. In 1741 the Lady Elizabeth, his wife, also died. "Thrice flew the shaft, and thrice his peace was slain." In his deep sorrow he began the composition of the "Night Thoughts," the first part of which appeared in 1742. The poem is a magnificent sermon on the vanity of life and the folly of an ill-spent career, and on the bright hopes which Christianity has opened up. It startles by its scenes of the grave, its dark picture of the sting of death, and its glimpses into another world, where the Judge is omniscient and just. The imagery of night is drawn with intense solemnity—its darkness, and its vast canopy studded with the host of heaven, all telling of the great God, and proclaiming his majesty.

The works written by Young after the "Night Thoughts" are quite valueless, and it is not necessary even to recount them. Those who admire the "Night Thoughts" (and what reader does not, in spite of their too apparent art and consciously-strained tone?) should not know too much of Young's life. While nothing derogatory to his character as an honourable man was ever known of him, yet the never-ceasing sharp pursuit of his worldly interests is quite out of keeping with that more than human sanctity which he assumed in his fine poem, and which he very possibly sincerely felt in his best and purest moments. The facts of the poem (the "three shafts," &c.) are treated with a very great "poetic license," and must by no means be taken literally in any case. At the death of the Duke of Wharton, however, Young claimed against his estates, and by a conduct of his case which would have been most admirable in an astute lawyer contrived to extract £200 a year from the executors. His poem of the "Instalment" to Sir Robert Walpole, when he became K.G., was so managed as to bring him in a pension. All his long life was one struggle for preferment and worldly honour so openly fought as to defeat its own object. Had he been more modest he certainly would have been made a bishop, and had he been a more sincere and better man he would have been a great poet. As it is he remained but a rector, and a writer high in the second rank. He solicited preferment when on the verge of the grave, and was made, through the influence of Archbishop Secker, clerk of the closet to the Princess Dowager of Wales, Young died on 12th April, 1765.

**YOUNG, THOMAS, M.D.,** the founder, if not the originator, of the undulatory theory of light, was the most clear-thinking and far-seeing physicist of the nineteenth century, as well as one of its most accomplished and profound scholars. He was born at Milverton in Somersetshire, on the 13th of June, 1773, and died in London on the 10th of May, 1829. His childhood and early youth were marked chiefly by the extraordinary assiduity, extent, and method of his studies, especially in ancient literature, Latin, Greek, and mathematics. When little more than a boy in years, he had carefully read and digested the whole of the "Principia" of Newton. From 1787 till 1792 he acted as tutor to Mr. Hudson Gurney of Youngsbury in Hertfordshire. In 1792 he commenced his education for the medical profession at St. Bartholomew's Hospital in London. In 1793 he sent to the Royal Society a paper on the muscular fibres of the eye, which led to his election as a fellow of that body in 1794. In 1794-95 he prosecuted his medical studies at the University of Edinburgh. In 1796 he continued the study of medicine at Göttingen, where he took the degree of M.D. In 1797, in order to complete his medical studies, he entered the University of Cambridge as a fellow commoner of Emanuel College. In the same year a kind and excellent uncle, Dr. Brocklesby, who had aided and encouraged him in his studies, died, and bequeathed to him a moderate fortune, which, without relieving him from the necessity of working at his profes-

sion, was sufficient to give him some freedom to follow the bent of his genius in the advancement of science. In 1800 he began to practise medicine in London. In 1801, 1802, and 1803 he communicated to the Royal Society, in a series of papers on the theory of light and colours, some of the most important discoveries ever made in physical science—embracing the fact of the interference of light, then first made known; the experimental investigation of the laws of that fact, and of its relations to the phenomena of diffraction, and of the colours of thin plates, thick plates, fibres, striated surfaces, &c.; and the theory by which that fact and its laws are accounted for, according to the hypothesis of luminiferous waves. This completed the *undulatory theory* of light, which had been first put into shape by Huyghens. From 1801 till 1804 Young held the professorship of natural philosophy in the Royal Institution, and delivered a series of lectures which he published in 1807, and which to this day forms the best existing compendium of the elementary principles of physics. It was far in advance of the time when it appeared. In 1808 he obtained the degree of M.D. of the University of Cambridge. Although he never became a popular or a fashionable physician, he appears to have had a fair amount of practice. Though continuing his researches at this time, Young rarely published them, as he considered they would militate against his status in his profession. He was a frequent contributor of scientific and literary articles to the *Quarterly Review*. Among the most valuable of his writings were his articles in the *Encyclopædia Britannica*, sixty-three in number; forty-six of which were biographic, and seventeen scientific. The latter contain accounts of some of his most important discoveries. In 1811 he began to turn his attention to the language and characters of ancient Egypt, in the interpretation of which he made greater and more important progress than had ever been accomplished by any previous, or, with the exception of Champollion, by any subsequent investigator. About the same period Young began to throw aside the secrecy which had long covered his scientific pursuits. His attention was recalled to the theory of light by the discoveries of Fresnel, who, without knowing anything of Young's researches in 1800–2, rediscovered the law of interference. It appears that the great idea of transverse vibrations, the foundation of the theory of polarization, occurred to them independently about the same time, but it was first published by Young in a letter to Arago in 1817, and was by Arago communicated to Fresnel. Those two philosophers were made acquainted with each other's discoveries through the mediation of Arago, and a friendly correspondence ensued between them, in which there is not the slightest trace of jealousy, or even of rivalry. In fact in 1825 the Royal Society of London awarded Fresnel the Rumford medal; and in 1827 the French Institute elected Young one of their eight foreign associates. He was frequently employed by the British government to report on scientific questions, and in 1818 was appointed secretary to the board of longitude, on the dissolution of which he became sole conductor of the *Nautical Almanac*. The immediate cause of his death, in his fifty-sixth year, was ossification of the aorta; but it was considered that his end was hastened by premature old age, brought on by excessive mental labour.

**YPRES**, an ancient town of Flanders, in the province of West Flanders, situated on a fertile plain on the Yperlee, 18 miles N.W. of Lille. It is well built, has remains of ancient fortifications, a magnificent Gothic church, an immense cloth-hall, now the town-hall, several churches, and two colleges. The inhabitants, numbering 17,000, are chiefly occupied in the manufacture of linen and lace. The town was formerly the capital of West Flanders. In the fourteenth century Ypres had a population of 200,000 souls, and upwards of 4000 looms were in constant activity.

A succession of popular risings, and the siege of the town and burning of the suburbs by the burghers of Ghent in 1383, caused a large number of the weavers to migrate to more peaceful abodes, and the industry of Ypres became almost entirely restricted to lace-making. Its subsequent capture by Louis XIV., who converted it into a strong fortress, was fatal to all prospect of revival. Ypres thus possesses now but a shadow of its former greatness, but it still contains many memorials of its golden period, which make it one of the most interesting towns in Belgium. *Diaper* (i.e. d'Ypres) linen takes its name from this town.

**YSEULT** or **YSOL'DE**. See **TRISTRAM**.

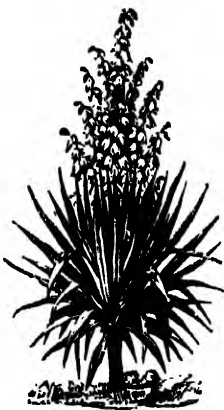
**YTTRIUM**, a rare metal, found only in a few scarce minerals. It was first obtained by Gadolin in 1794 from the ytterbite or gadolinite of Sweden. It occurs in this mineral associated with other rare metals, glucinum, cerium, lanthanum, didymium, and erbium. From the latter metal it is separated with difficulty, by repeated fractional crystallizations of the nitrates, the yttria salt coming out last. The metal is obtained from the chloride by ignition with potassium. It presents the appearance of a metallic dark gray powder. The symbol is Y, the atomic weight 61.7. It unites directly with oxygen and chlorine. The only oxide is yttria (Y<sub>2</sub>O<sub>3</sub>), obtained usually by igniting the oxalate; it is a white powder, which glows with a brilliant white light when ignited. It does not combine directly with water, but is precipitated as a hydrate by caustic alkalis from the solutions of its salts. It is soluble in nitric, hydrochloric, and sulphuric acids. The sulphate has the formula 3YSO<sub>4</sub>.H<sub>2</sub>O. The oxalate (C<sub>2</sub>Y<sub>2</sub>O<sub>3</sub>.H<sub>2</sub>O) is a white insoluble powder. The chloride (YCl<sub>3</sub>) and bromide (YBr<sub>3</sub>) are deliquescent crystals. The fluoride (YF<sub>3</sub>) is found native associated with fluorides of cerium and calcium as yttrocerite in Sweden.

The yttrium salts are colourless, and in their reactions resemble those of thorium from which metal yttrium is distinguished by the solubility of ignited yttria in hydrochloric acid, and by the chloride being non-volatile. It is usually estimated as yttria, being first precipitated as oxalate, and then ignited; but it cannot be quantitatively separated with accuracy from the erbia which always accompanies it. Yttria has recently excited much interest among chemists on account of the remarkable investigations of Mr. Crookes; as his experiments with spectroscopic analysis on the effects of the electric discharge in vacuo on this element appear to show that he has decomposed it, thus apparently foreshadowing the composite nature of the present elementary bodies.

**YUCATAN**, a peninsula of Central America, between the Caribbean Sea east and the Gulf of Mexico west and north, and has on the north-east a channel of the same name, 125 miles wide, connecting these seas, and separating it from Cuba. It is about 350 miles long, in a direction N.N.E. and S.S.W., by 190 miles in breadth, and its area is calculated at about 70,000 square miles. It is divided politically into the Mexican states of Yucatan and Campechy, and the British colony of Belize or Honduras, and includes the northern part of Guatemala. The interior is for the most part flat, sandy, and arid, and the inhabitants often suffer from continued droughts. Toward the coasts the soil improves, there is more humidity in the atmosphere, and fine forests cover many tracts. The principal products are rice, cotton, maize, tobacco, the sugar-cane, pepper, fruits, cocoa-nut, and dye-woods. There are no rivers in Yucatan that run above ground, so the people are dependent upon the clouds for their supply of water, or upon a curious system of underground rivers. The province is a vast table of coral rock, beneath which flow large streams, which break out at intervals into water-caves, called "cenotes." The ancient cities were always built near these caves, and the Indians, centuries ago, marked the course of these subterranean streams by heaps

of stones. Some of the "cenotes" are made use of as bathing places—most refreshing resorts in the heat of day. Some have fish, said to be blind, like those in the Mammoth Cave of Kentucky. Many cattle are reared; and these, with the above products, honey, wax, salt fish, *Agave mexicana*, for paper and cordage, &c., tallow, and hides, form the principal exports. About one-sixth of the inhabitants are of Spanish descent, the rest being Indians of some ancient stock, whose origin and history are obscure. They live in a state of semi-barbarism, surrounded by the ruins of magnificent cities, with palaces, temples, pyramids, and other interesting monuments of a people of superior civilization and skill in the ornamental arts. Yucatan is full of these remains; some of the best preserved are at Uxmal and Chichen (lat. 20° 30'); on islands on the central lake, Peten or Izta, west of Belize; on the southern border, at Palenque; and they occur also at Copan, in Honduras, besides various other places. It seems probable, from the latest researches, that the Mexican civilization was derived from people located on the table-lands of Chiapas and Quesaltenango, and who are still represented by the Lacandones, Manches, Choles, and other tribes yet unsubdued, belonging to the Tzendal or Maya family, and speaking dialects of one original tongue. This language is the Tzendal or Maya, spoken by the Huastecas on the river Panuco, near Tampico, in Mexico, and is the original of twenty different dialects. The fresh or unfinished state of some of the ruins—blocks lying chiselled in the quarries, or left half-way between the quarries and the buildings—show that the labourers were arrested at their work by the sweeping irruption of the fierce spoilers; while casual allusions in the Spanish accounts of the conquest, many of which are quoted by Stephens, leave little doubt that the wholesale destruction of this people was accomplished by the Spaniards themselves. By some, however, a much higher antiquity, and even an Asiatic or Egyptian origin, is assigned to the remains. From the structure of certain dramas, which have very recently been taken down from dictation of the natives by European travellers, and the resemblance of many words, an hypothesis has been formed that the Central American civilization has originated from German or Scandinavian sources.

**YUCCA** is a genus of plants belonging to the tribe Draceneæ, of the order LILIACEÆ. The species are natives of the southern states of the Union and in Mexico, a few extending into South America. They are commonly cultivated in this country, where they are popularly known as Adam's needles. They have the habit of palm trees, with a crown of large sword-shaped, rather rigid evergreen leaves, from the centre of which arises an erect panicle of large showy flowers, generally white. The flowers have a six-leaved bell-shaped perianth, six stamens, and a three-celled ovary, becoming an oblong bluntly hexagonal three-valved capsule, containing many seeds. *Yucca gloriosa*, the best known species, is a native of Virginia and Carolina, and was introduced into England in 1596. The stem is from 2 to 5 feet high, bearing a crown of broad, stiff, dark green leaves, and the panicle is 3 feet or more in height, branching out on each side, with drooping, bell-shaped, scentless flowers,



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white, with a purple stripe on the outside of each leaf of the perianth. The leaves of this and other species, if treated like hemp and flax, afford a fibre which may be employed in the manufacture of cloth or cordage; and the macerated stems deposit a feculent matter, yielding a quantity of starch. At Carthagena a starch or glue is made from the stem of *Yucca gloriosa*, and used for food. Eight or nine other species are cultivated in this country as ornamental plants. They succeed best in a sandy soil, and may be propagated by suckers from the roots or by side-shoots, which are occasionally produced on the stem. Some of the species are rather tender, and seldom ripen their seeds in this country.

**YU'KON** or **KWICHPAK**, a river of Alaska, in North-west America, formed by the junction, within British territory, of the Lewis and Pelly rivers, which rise in the highlands, a continuation of the Rocky Mountains west of the Mackenzie River, whence it flows N.N.W. and south-west to Norton Sound, in the Pacific Ocean, south of Behring Strait. It is about 1500 miles long, and is navigable throughout its whole extent; at 600 miles from its mouth it is  $1\frac{1}{2}$  mile wide. Area of basin, 250,000 square miles.

**YULE**, the old English name for Christmas, which appears to be of Celtic origin, and derived from *yegl* or *guygl*, a holiday. Many of the ancient Celtic (Druidic) and Teutonic customs, such as the mistletoe of the first, and the pine tree of the second, survive as parts of the Christian festival.

**YUN-NAN**, a province in the extreme south-west of China, bordering on Anam, Burma, and Tibet. The surface is mountainous in the north and west, but descends south-east into undulating plains. It is traversed by the Kin-sha Kiang and the upper portion of the Song-ca, the Salween, and the Meikong, the two latter in deep, precipitous gorges. The poppy forms one-third of the whole cultivation of the province. The climate of the country varies from alpine cold to tropical heat, but even in the most southerly portion a temperate zone exists on the plateaus overlooking the gorges of the River Salween and the great lakes which constitute a peculiar feature of the province. Metals such as silver, copper, lead, and tin have for centuries past been drawn from the mines for which Yun-nan is famous; in fact, it has long been the chief metal-producing district of the empire. Traces of gold are to be found in the sands of every mountain stream, and both soil and climate are favourable to the cultivation of such important articles of commerce as tea, silk, and rice. The Brahmaputra, falling into the Bay of Bengal, bounds the country or the west. The Liawaddi and the Salween rivers make it not less accessible from the Gulf of Martaban. The Meikong, the Yang tse Kiang, and the Hoang-Ho open the road to the south-east and east. The area is 120,000 square miles, and the population is said to be extremely dense.

**YVETOT**, a town in Normandy. The "King of Yvetot," whom Béranger has made the proverbial analogue of our "Jolly Miller" of the Dee ("I care for nobody, no, not I, and nobody cares for me"), is a whimsical title really borne of old by the lord of the manor. The son of King Chlodwig (Clovis) slew Gualthier, lord of Yvetot, before the high altar in Soissons Cathedral, and by way of compensation the title of "king" was conferred upon the barony.

Béranger's king is thus described:—

"Il était un roi d'Yvetot  
Peu connu dans l'histoire:  
Se levant tard, se couchant tôt,  
Dormant fort bien sans gloire;  
Et couronné par Jeanneton  
D'un simple bonnet de coton."

He ate his four meals a day, his steed was an ass, his palace had a thatched roof, and he was absolutely happy.

**Z**, the sonant spirant sibilant in English, was, like Y, not contained in the original Roman alphabet, from the latest versions of which it has been transferred to the alphabets of Western Europe. In the Greek series of letters it occupied the seventh place, the sixth being the subsequently disused Vau or F. It was not known in the oldest English, and through the influence of Norman-French has taken the place of an older *s*; thus *dizzy*, *freeze*, stand for the old *dyzig*, *frosan*. It also stands for a French *c* or *s*, as *hazard*, *buzzard* (for *hasard*, *busard*). It has intruded into *citizen*, the French *citoyen*. It occasionally is replaced by *g*, as *ginger* for *zinziber*.

**ZACHARIAS, ST.**, Pope, a Greek, who succeeded Gregory III. in the see of Peter, was the first pope to be elected without the consent of the Emperor of Byzantium or of his exarch in Italy. Gregory had appealed to the Frankish prince Pipin against the usurpations of the Lombard. Zacharias did more, he went to the camp of Liutprand and overawed him, by the well-known sanctity of his character and the severity of his denunciations, into giving up the four cities which Pipin had promised the papal see. Thus began the temporal dominion of the popes, which our own age has at length seen taken from them. A second visit was necessary later on, and this was accompanied by a cloud, sent by the special intervention of St. Peter, to shield the Pope from the great Leat. This miracle completed the submission of the ambitious king; and his successor Rachis actually left the kingdom for a convent under the spell of Zacharias.

Finally, this powerful pope, on being consulted by Pipin, agreed to the Frankish monarchy being taken from the Merwings (Merovingians) and assumed by himself. Thus began the Karling or Carolingian dynasty, under the direct papal sanction. The far-reaching consequences of this act could not be seen by the bold pope, but even then it was a strong position to take. Zacharias was succeeded by Stephen II. in 752.

**ZAFFRE** or **SMALTS**, a blue pigment used in colouring glass and pottery. It is made by roasting cobalt ore with sand, and is an impure oxide of cobalt. See COBAL T.

**ZAIRE.** See CONGO RIVER.

**ZAMBE SI** is the name of the principal river in Eastern Africa, which has been rendered memorable by the discoveries of Dr. Livingstone. In the upper part of its course it is called the Leambye. It flows first in a south-east direction to some distance below the Victoria Falls; it then turns to the north-east, and afterwards runs direct east to the Portuguese town of Tette. In this part of its course it varies in width from 500 yards to 2 miles. Below Tette it again assumes a south-east direction, and about 100 miles from its mouth, in the Mozambique Channel, it receives the Shire on the north. The latter river rises in Lake Nyassa. About 50 miles from the sea the Zambesi divides into several branches, and thus forms a delta which is very unhealthy, in consequence of its malarious exhalations. The principal mouths are the Quiliman and the Luabo. The Zambesi is navigable as far as Tette, though with difficulty in the dry season, as there are then some dangerous rapids in the Laputa Mountains, but when the river is at its full vessels glide over them with safety. The total length of the Zambesi cannot, of course, be accurately stated, but it is certainly not less than 1200 miles.

Probably the most striking feature of the river is the very extensive falls which occur, in apparently about the middle of its course, named the Victoria Falls. They are

formed by a fissure in the hard basaltic rock which at that point forms the bed of the stream. The opening is only from 80 to 100 yards wide, but about 400 feet in depth, or twice that of Niagara. Immediately above the falls the river is more than a mile broad, and as this vast body of water has to force its way through an aperture about one-twentieth of its width, and falls such an immense height, it produces on the mind an effect of wonder and amazement—almost of terror and awe. In the native language the falls are called *Monioa-tunya*, or "The Smoke Ascending," in consequence of the enormous quantity of vapour that arises from them, and which can be seen at a distance of 20 miles.

**ZAMO'RA**, an ancient town of Leon, in Spain, and the capital of a province of the same name, is situated on the right bank of the Douro, 130 miles N.W. from Madrid on the railway to Vigo, and has about 11,000 inhabitants. It is separated from its suburbs by walls, in which there are eight gates. The streets are narrow, the houses lofty, and the general aspect of the town sombre. The numerous churches and the town-house are the finest buildings. There are some manufactures of hats, serges, gunpowder, and leather, and a trade in wine and corn. Zamora was of great importance, and very strongly fortified, in the time of the Moors. It derived its name from a word in their language signifying turquoise, large numbers of these precious stones having formerly been found in the neighbourhood. It was taken from the Moors in 748 by Alphonso the Catholic, but was recaptured by them in 985. Ferdinand the Great finally annexed it to Castile in 1093, and it was the seat of the Cortes in 1297 and 1302. The town was entered by the French in 1809; and although no resistance was offered by the inhabitants, they were treated in a most barbarous manner, neither age nor sex being any protection against the invaders.

**ZAMPIERI, DOMENICO** (1581-1611), the famous painter, commonly called DOMENICHINO.

**ZAMPO'GNA** or **SAMPOGNA**, the Italian form of the BAGPIPE.

**ZAMR.** See ZORNA.

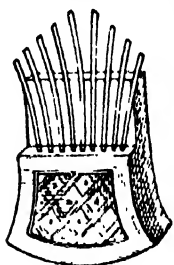
**ZAN'TE**, one of the Ionian Islands, the *Zakynthos* of the ancient and modern Greeks, situated about 8 miles south of Cephalonia, and 15 west of the Morea, is a beautiful and fertile island. It is about 23 miles long, and consists chiefly of an extensive plain that stretches from the north to the south coast, with a breadth of 6 to 11 miles, and terminates westward in a range of hills running parallel to the coast, and eastward in Mount Skopo and the hills about the city of Zante. It has an area of about 165 square miles. The products are similar to those of the other islands, but more abundant. Pomegranates, peaches, melons, and citrons are cultivated, and some salt is manufactured. The great trade of the island is in currants, the fruit of a dwarf vine originally brought from Corinth, and olive oil, and factories have been established for obtaining pyrene oil from the refuse of the olive mills. The petroleum or pitch wells, described by Herodotus (iv. 196), are about 12 miles south from the town of Zante, in a marshy district, near the shore of Chieri Bay, in the south-eastern part of the island. Another well, called the *Yellow Well*, is in a cavern on the shore. There are very few remains of antiquity in the island.

**ZANTE**, the largest, most populous, and most commercial town of the Ionian Islands, stands at the head of a bay on the east coast. The population is 20,000. The streets are narrow, as in all warm climates; the houses are well

built, chiefly in the Italian or Venetian style. The churches are numerous, and richly ornamented. There are two piazzas or squares, in one of which is erected a handsome monument to Sir Thomas Maitland. The harbour is protected by a wall, and has a lighthouse; but it is much less secure than those of Theaki and Cephalonia. From the citadel, which stands on the highest part of the town, there is a magnificent view over Cephalonia, the Gulf of Lepanto, and the coast of the Peloponnesus. Zante is the seat of a Greek archbishop and a Catholic bishop; it has a theatre, custom-house, and an arsenal. The city has frequently suffered from earthquakes.

#### ZANTHOXYLON. See XANTHOXYLON.

**ZAN'ZE**, a rude instrument with vibrating metal tongues or rods, set in vibration by the thumbs, the body being held by the two hands, used among the negroes of Guinea. The body is of wood, carved roughly. The tongues are sometimes of hard sonorous wood.



The *kassanguh* of Delagoa Bay is a similar instrument; and other varieties are the *ibeka* of the Bakalai negroes, Gaboon River, the *ambira* of Mozambique, and the *vissandochi* of the Congo; in short, the instrument may be regarded as characteristic of the advanced negroes. Sometimes the tongues are made movable, giving the power of tuning. No regular scale has as yet been observed, and many students consider that none is aimed at, that musical rhythm (as with cymbals, &c.) is the design of the instrument, not melody.

consider that none is aimed at, that musical rhythm (as with cymbals, &c.) is the design of the instrument, not melody.

**ZANZIBAR'** or **ZANGUEBAR** (called by the Africans *Unguje*), an island off the east of Africa, between 5° 40' and 6° 30' S. lat.; 55 miles long N.N.W. to S.S.E., averaging 13 miles in width. It is surrounded by coral reefs and islets, but a deep channel, 30 miles wide, separates it from the mainland. The land rises in the interior to about 400 feet, and is for the most part very fertile; rice, sugar-cane, manioc, millet, &c., are grown on the lowlands. Between the cocoa and mango groves numbers of country houses appear, consisting of the seats of the dominant Arabs and the huts of their slaves. The hedges are of laurels, wild oranges, lemons, and other evergreens, which are often overgrown with jasmine and other creeping plants. The chief exports are cocoa-nuts, cloves, and copal. The population is estimated at from 300,000 to 400,000, consisting of the Arab owners of the soil, numerous half-castes, Comora Croles, and natives of India, Banyans, and Lascars, with African slaves. The area is about 625 square miles. The temperature ranges between 70° and 90° Fahr. January and February are the hottest months, March, April, and May are the months of heaviest rain, and there is a second period of heavy rain in November and December. The whole rainfall during the year averages about 60 inches at the town of Zanzibar; but the periods and quantities of rain are very inconstant from year to year. In December, January, and February the north-east monsoon prevails; during the rest of the year south-easterly winds are most frequent. The town of Zanzibar has a population estimated at 90,000, and Bagamoyo, on the opposite mainland, 10,000. The island is under the rule of a sultan, whose territory extends on the African coast from the settlement of Warsheikh (2° 25' N. lat.), on the southern coast of Somali Land, north of the mouth of the Juba River, to the village of Tungue, immediately south of Cape Delgado (10° 43' S.), where these dominions touch upon the possessions of Portugal. The authority of the sultan thus extends between limits more than 1600 miles apart on the shores of the Indian Ocean; but it is by no means continuous along this stretch,

and in 1886 England, Germany, and France agreed to settle the limits of the sultan's authority, and fixed the boundary with the Portuguese possessions at the point where the Misingani River enters the Mozambique Channel, while along the coast the authority of the sultan was confirmed for about 10 miles inland. The Portuguese, however, in spite of this, in 1887 seized the territory awarded as far as Cape Delgado.

The chief points and settlements belonging to Zanzibar, from north to south, are—the Island of Warsheikh, already mentioned; the ports of Magadoxo, Merka, and Barava, north of the Juba mouth; Port Durnford; the coast islands of Patta and Lamu; the old Arab settlement of Malindi (where Vasco da Gama obtained the pilot who steered his ship across the ocean to India), Mombas, Wasin, Tanga, Pemba Island, north of that of Zanzibar; Pangani, at the mouth of the Rufu River opposite; Saadani and Bagamoyo, opposite Zanzibar island, on the mainland (the point of departure for most of the caravans for the interior); Dar es Salam, Konduchi, and Mboanaji, further south; the Island of Mafia, Kilwa, Kivinja, and Kilwa Kisiwani, Lindi, and Mikindany Bay, furthest in the south, not far from the mouth of the Rovuma and Cape Delgado. It may be said that the authority of the Sultan of Zanzibar also extends along the main caravan route towards Lake Tanganyika, 700 miles distant from the coast, on which are the important Arab stations of Tabora, in Unyamwebe, and of Kowele, in Ujiji, on the shores of the lake. The sultanate of Zanzibar owes its origin to the Arabian princes who were invited by their colonists on the coast to defend them against the Portuguese, but who did not assert their dominion till they captured Mombas in 1698. The Island of Zanzibar was conquered in 1781 by an Imam of Muscat. On the death of the Imam Said-Said, in 1856, his states were divided between his two sons, and the African possessions are now independent of Muscat. In 1875 the sultan visited England, and has since, under the guidance of the English representative, done his utmost to suppress the slave trade, and lent valuable aid to the expeditions of Stanley and others into Central Africa.

**ZARLI'NO, GIOSEFFE** (*Zarlino Clodiensis*), a celebrated early authority on the theory of music, was born at Chioggia (Clodia), near Venice, in 1517, and was educated for the church. He was a man learned in many languages as well as in music. He succeeded De Kore (Van Boor) at Venice as musical director at St. Mark's, and preferred to retain this honoured office to receiving the bishopric of Chioggia, to which he had been chosen in 1583. He died at Venice in 1590 in great honour. During his life the republic struck a medal bearing his portrait, and on the reverse an organ, to pay respect to him. His fame rests on his "Istitutioni armoniche" (Venice, 1558); "Dimostrazioni armoniche" (Venice, 1571), and "Sopplimenti musicali" (Venice, 1588), all being published together in the collected edition of 1589. To show the wonderful mastery of his subject this extraordinary man possessed, we find him advocating equal temperament with twelve semitones to the octave a full century before Bach. He had a great controversy with Vincenzo Galilei, the father of the astronomer, on this and other points. He was so far in advance of his age that he was not well treated, and what we now see to have been valuable discoveries were scouted as idle dreams by his opponents. Nevertheless all had to agree in his supremacy of musical knowledge.

**ZE'A** (the ancient *Ceos*), an island of the Grecian Archipelago, about 13 miles south-east of Cape Colonna. It is 14 miles long from north to south, 10 broad from east to west, and is of a very compact and somewhat oval form. Beyond the coasts, which are generally low, the ground rises in one terrace towards the centre, where it culminates in Mount St. Elias. The prevailing rock is

limestone. The climate is salubrious, and the soil fertile and well cultivated, producing in abundance barley, cotton, wine, and figs. The pastures also feed great numbers of cattle, and much attention is paid to the rearing of silkworms. Population, 9000. Zea, the capital, occupies the site of the ancient Zulius, on a small stream, about 3 miles from the north-west shore.

#### ZE'A. See MAIZE.

**ZEALAND** or **ZEELAND**, the southernmost province of the Netherlands, formed principally of the islands between the Scheldt and the Maas, but also including a portion of the low-lying land on the Continent south of the former river. It is bounded N. by branches of the Scheldt, which separate it from the islands of Overflakkee and Goeree. E. by the provinces of North Brabant and Antwerp, S. by Flanders, and W. by the German Ocean. The area is 690 square miles, and the population in 1884 was 193,965. The surface is only a few feet higher than the sea, from which, in fact, most of the soil—a rich black mould, and very fertile—has been reclaimed. The lands thus rescued are called *Polders*. They are generally protected by dams and dykes. The climate is damp and variable, but not so unhealthy as formerly. The chief occupations are agriculture, the breeding of cattle and sheep, and fishing. Wheat, barley, oats, rye, pease, beans, potatoes, and madder are the chief crops, and there are also some large orchards. In addition to the fisheries great numbers of water-fowl and their eggs are taken on some of the islands. There are manufactures of linen, woollen, and fine yarns, distilleries, breweries, salt-works, scap, vinegar, starch, and tobacco factories, tile and brick kilns, tanneries and dockyards for shipbuilding. Many of the inhabitants are also engaged in rendering the large quantity of madder grown in the province suitable for commerce. A fine ship canal was opened in 1866 through South Beveland, which is also intersected by railways communicating with those on the mainland. The chief islands are Beveland and Walcheren.

#### ZEALAND, NEW. See NEW ZEALAND.

**ZE'BRA** is the name given to the striped species of the genus *Equus* (Horse), which, as they resemble the ass more nearly than the horse, are placed in the subgenus *Asinus*. The Common Zebra (*Equus zebra*) inhabits the Lilly districts of South Africa. It stands about 4 feet high at the shoulder, and is gracefully built, with an erect, bushy mane, slender limbs, and narrow hoofs. It is the most beautiful of all the wild Equidae. The general ground colour is white, and the entire body, head, and limbs are striped with narrow black bands, those on the body being irregularly vertical, while those on the legs are horizontal. The zebra lives in small herds, sometimes numbering upwards of 100 individuals. They are very shy and difficult of approach; but when attacked they defend themselves in a body, using their heels vigorously. In spite of its fierce and untractable temper, the zebra is domesticated and used as a beast of burden. Hybrids have been produced between the zebra and both the horse and the ass. The flesh is eaten, but is coarse and unpalatable. Burchell's Zebra (*Equus burchellii*) inhabits the plains of South Africa, north of the Orange River, where it is found in great numbers in herds of 80 to 100, usually in company with the brindled gnu. It is rather larger and more stoutly built than the former species, which it equals, or perhaps surpasses, in beauty. The head and upper parts of the body have a reddish-brown ground colour, and are beautifully streaked with irregular, wavy, broad black bands, which do not unite with the longitudinal streak on the back. The tail, legs, and under parts of the chest and belly are white, with a few irregular black bands on the legs. It is very fleet, shy, and fierce. Like the common zebra, it is capable of being tamed, but under the most favourable circumstances is obstinate and treacher-

ous. The QUAGGA (*Equus quagga*), also a native of South Africa, is a nearly allied, but less beautiful, species.

**ZE'BU** (*Bos indicus*) is a species of Ox, a native of India, whence it has extended into Persia, Arabia, and Eastern Africa. It is distinguished by its short head, convex forehead, short horns, large drooping ears, large folded dewlap, and a fatty hump on the withers. It varies exceedingly in size and colour. Some breeds are larger than any of the European oxen, while others are only the size of a donkey or even smaller. The colour is usually grayish-white and ash. Some breeds are hornless, and have small humps. The zebu is very gentle and docile, and is used both as a beast of burden and to draw light



Zebu or Brahman Bull.

vehicles. The flesh is good, but not equal to ordinary beef, but the hump is esteemed as a great delicacy. The Brahman or sacred bulls of the Hindus belong to this species. They are regarded with the greatest veneration, being fed and protected in every way by the Hindus.

#### ZECHINO. See SEGIN.

**ZECHARIAH**, the eleventh in order of the twelve minor prophets. Of his personal history but little is known, but he seems to have been born in Babylon, to have returned with the first caravan of exiles under Zerubbabel, and to have commenced his prophesying in the second year of Darius king of Persia, 520 B.C., two months later than Haggai. The book of Zechariah consists of four general divisions: (1) the introduction or inaugural discourse (i. 1-6); (2) a series of nine visions extending to chap. vii. communicated to the prophet in the third month after his installation; (3) a collection of four oracles delivered at various times in the fourth year of Darius with regard to the solemnities that had been observed on account of the overthrow of the nation (vii.); (4) the following chapters (viii. to xiv.) contain a variety of prophecies unfolding the future of the people and the fate of many of the surrounding nations, Hadrach (probably Persia), Damascus, Tyre, and Philistia. The book concludes with a vision of the prosperity of Jerusalem.

The book of the prophet Zechariah is the longest of the minor prophets. The style is broken and unconnected, and many scholars incline to the opinion that probably two, and possibly three, distinct oracles, delivered at different periods in the history of the nation, have been put together by a later editor as one work. Internal evidence favours the theory that the section, chaps. ix.-xiv., was composed before the time of the Captivity. Special commentaries on Zechariah have been written by Forberg (1824), Howard (1821), Baumgarten (1860), Kliefoth (1862), and Pressel (1870). See also the *Bampton Lectures* for 1878.

**ZECH'STEIN** (Ger., mine-stone), the German miner's equivalent for the English term *magnesian limestone*, having reference to the fact that this rock is picked in the Thuringian copper mines before reaching the underlying productive *Kupferschiefer*.



**ZEDOARY.** See CURCUMA.

**ZELKONA TREE** (*Planera Richardi*) is a tree nearly allied to the ELM (*Ulmus*), a native of Western Asia, on the shores of the Caspian Sea, and the south of the Caucasus range. It is a deciduous tree, growing to a height of from 50 to 70 feet, with a large tufted much branched head, alternate elliptical leaves, and small, greenish, bell-shaped flowers. The bark of the trunk is furrowed and is shed in scales. The Zelkona tree is cultivated in this country, into which it was introduced in 1760, and may be propagated by grafting on the elm. The heartwood is very heavy, extremely hard, and fine-grained; it is used for making furniture and for the same purposes as oak. The sapwood is very elastic, and is used for the same purposes as ash. *Planera Gmelini*, a native of the Southern States of America, is a shrub or low tree, occasionally cultivated in England.

**ZEMBLA, NOVA.** See NOVA ZEMBLA.

**ZEMINDAR'** (*Zemind*, land), a Persian word which literally signifies a landholder. In Hindustan a number of villages at one time formed a district; the head man of such a district was called a *Zemindar*, and the district itself a *Zemindari*. Superior to the zemindars were the *nabobs* or provincial governors, and from these, on payment of a certain annual sum, the former received fiefs, which exempted their district from any further taxation. This annual sum was levied, with interest, by the zemindars from the *ryots* or cultivators of the land, and formed the staple of the imperial revenue. The zemindars, in turn, had under them a class called *harildars*, who were the real collectors of the taxes imposed by the former. The system was productive of the worst oppression toward the poor *ryots*, especially when, in 1772, the government let out the zemindari to the highest bidders. The zemindar bade a high amount with the idea of having a still larger sum collected by his subordinates; and these in their turn took care to add on a large percentage for themselves; so that the Hindu villager often suffered from the most unjust extortion. To a certain extent the same system is still carried out by the British government, especially in Bengal, though, of course, it is divested as far as possible of its oppressive tendencies.

**ZENA'NA** or **ZANA'NA** (Pers., belonging to women) is that part of a house in India to which the women are confined. Among Hindus of good caste and position the house consists of rooms built around two square courts; those around the front one are fine, with verandahs and windows looking upon the street, are well furnished and comfortable, and are devoted to the men. The ground floor is used for store rooms, carriage houses, and servants' quarters. The rooms built round the back and smaller court constitute the *zenana*, and here a woman passes her entire life, only exchanging her father's *zenana* for her husband's. She is allowed to go out on rare occasions to worship at a temple or to visit her father's house, but then she is carried in a palanquin, and thoroughly shut up, to avoid all possibility of seeing or being seen. Her only knowledge of the outside world is that brought in by the female hairdresser, who comes once a week in pursuit of her avocation. The wife of the oldest inmate of the house rules over the *zenana*; her word is law, and her several daughters-in-law and granddaughters are obliged to render her implicit obedience. The monotony and drudgery of the Indian wife's life, with her daily routine of cooking, diversified by the dressing of her hair, is only exceeded by that of the widow, which is made so wretched that the abolition of *suttee* has been rendered a doubtful benefit. Until about 1860 women in India were completely shut in by caste, prejudice, and religious tenets from contact with Christian ladies, but in that year a missionary's wife prevailed upon one of the more enlightened of the *baboos* to allow her to instruct his wife in needlework. This was

the beginning of *zenana* mission work, and now in all the great centres of Indian life there are numerous British, American, and native ladies engaged in imparting instruction to Indian women and girls. Secular education is encouraged by grants from the government.

**ZEND AVESTA** and **ZEND LANGUAGE.** The Zend Avesta (or Avesta Zend, as the Pehlvi books always put it) is the Bible of the ancient Persian religion of Zoroaster, now professed by the Parsees. *Avesta* (*avasthá*) means "text," *Zend* means "commentary;" and unfortunately a very little text remains, nearly the whole being Zend of which the Avesta has disappeared. Zoroastrian MSS. were in European libraries in the early part of the seventeenth century, but no one could decipher them. This was accomplished by a young Frenchman, Anquetil-Duperron, who went to Persia in 1754, prevailed upon the *dusturs* or priests to initiate him, and teach him both the Zend language and its descendant the Pehlvi, and translated the whole into French, beginning his work in 1759. He brought back with him 180 Oriental MSS., many of them ancient Persian, being supplied with funds for this purpose by the French government. His translation appeared in 1771, and created a profound sensation—many doubting its authenticity, especially our own distinguished Indian scholar, Sir William Jones. It was eventually set beyond doubt, however, that the Zend language was a very ancient Aryan tongue, older than Sanskrit proper, and closely akin to the very ancient Vedic form of Sanskrit. Rask, the Dane, is entitled to the first honors of this discovery, which resulted from his journey to the East in 1816 to study the languages on the spot. He was followed in time, and far distanced in results, by Eugène Burnouf, the real founder of Zend studies as they are now pursued in Europe. The numerals up to ten may be given as specimens of the language, showing its closeness to Sanskrit and Greek:—*aeua, dru, thri, chathware, poncha, kshvas, hapta, asta, nava, daca*.

The oldest parts of the Avesta, and the only parts referred to Zoroaster and his immediate disciples, are the five Gathas or "songs" (1000 or 1200 B.C.), a scanty fragment of what was once a whole literature. Next oldest are the Yazna or "sacrifices," in seven chapters. Then comes the Vendidad (900 or 1000 B.C.), conversations between Zoroaster and Ahura Mazda, the work of later priests; then the younger Yazna, in later Zend, and the Visparad, a collection of prayers and ceremonies in twenty-three chapters; and last of all the twenty-four Yashts or songs and conversations (about 500 B.C.), laudations of individual sacred persons and objects of the date when the whole compilation was made. As to the original size of the Avesta, Pliny speaks of 2,000,000 verses known to exist by Zoroaster, and in the Arabic writers we find 12,000 cow-skins mentioned as the number of rolls required for one copy of Zoroaster's own work. These are probably exaggerations, but it must have been very large. The conquest of Alexander the Great, with the devastation it caused, wrecked the whole of this literature and left us but the fragments which remain (in themselves a large collection). There were once twenty-one large divisions of Avesta, each with its Zend. Only one now remains complete, and that in its comparatively modern redaction, namely, the Vendidad. The whole Avesta was preserved (like the religious works of our own Druids) by memory, nothing was written for several generations. The Vendidad is the Pentateuch of the Zoroastrians. It is in twenty-two chapters, and is evidently the work of many hands and imperfect as we have it. It is a collection of laws, ceremonies, and observances.

See also the article ZOROASTER. All the sacred writers are called Zoroaster (Zarathustra) indiscriminately, but the great founder of the whole religion has his family name added, Zarathustra Spitama.



**ZENI**, the "cash" of Japan. Sixteen hundred go to the *itiboo*, which is worth about 16*d*. One zeni is worth therefore about the hundredth of a penny.

**ZENITH** and **NAZIR** are two terms imported into Europe with astronomy, to signify the point of the heavens

immediately above the spectator and the opposite (invisible) point below him. The first is the Arabic *as'samt* (azimuth or zenith), meaning the path; the second is *Nazir's s'amt* or short *nazir*, that which corresponds to the *saint*.

**ZENITH SEC'TOR** is a telescope, *T*, swinging on the pivots *A*, *B*, and having attached to it an arc, *CDE*, graduated into degrees and minutes. From *B* hangs the plumb-line *BF*, a very fine silver wire, the weight *F* being immersed in water to keep it steady. If we look through the telescope at a star nearly overhead, the plumbline,

crossing the graduated arc, will at once show the deviation of the axis of the telescope from the vertical, and therefore the position of the star with regard to the zenith or the horizon.

**ZENO** (Gr. *Zénôn*), the Eleatic philosopher, was born at Elea, in Southern Italy, about 490 B.C. He was the favourite pupil of Parmenides. In Plato's dialogue, entitled "Parmenides," it is related how Parmenides and Zeno came to Athens and held a philosophical conversation with Sokrates, when the latter was a very young man. This must have been about 450 B.C. At this time, too, he taught the great Perikles. But he preferred the quiet of Elea to the turbulent magnificence of Athens, and soon returned home. Zeno was intimately associated with Parmenides, not only in the pursuits of philosophy, but also in the avocations of practical life. They took an active part in the administration of the affairs of their native city. Zeno is said to have stood forth as the resolute opponent of tyranny. Whether he was successful in his resistance, or perished in the attempt to obtain for his country a freer form of government, is a matter of uncertainty. The philosophy of Zeno differed but little from that of Parmenides and their common master Xenophanes. Both regarded the reason, and not the senses, as the organ of truth. Both argued for "Being," "the One," "the Permanent," as that which alone existed; "the Many" or "the changeable," being the opposite of "the One," was identical with "Non-being." But, as Plato tersely puts it, Parmenides asserted the existence of the One; Zeno proved the non-existence of the Many.

The great feature of Zeno's teaching was his invention of dialectics—that is, the discovery of error by constant questioning, bringing out a *reductio ad absurdum*. This was the weapon which Sokrates afterwards converted to so noble a service. What is memorable in this philosophy is the attempt which it makes to signalize, in the strongest terms, the contrast or antithesis between sense and reason, and to exhibit the truths of reason in their most extreme opposition to the intimations of the senses. This opposition is principally set forth in those subtle puzzles of which Zeno was the author. One of these is the well-known "Achilles and the tortoise." If the tortoise has the start of Achilles by 100 feet he can never overtake it, for when Achilles has advanced 50 feet the tortoise will have advanced in a corresponding ratio, and so on in a progress in which the tortoise keeps the lead for ever. It is no solution of this paradox to show that Achilles does actually out-trip the tortoise. That, in fact, is the very circumstance which occasions the difficulty, for if he did not overtake it there would be no contradiction in the case.

The same argument strikes at the possibility of all motion. Motion, which is true in point of fact, is shown to be impossible on grounds of reason, for the shortest space is indefinitely divisible, and therefore a body in passing from one point to another must traverse infinity, which it cannot possibly do. The solution of these puzzles is that it requires time, say a minute, to pass over the given space: this time is *infinitely divisible*, but is not an *infinite time*. The puzzle carefully confounds the two.

**ZENO** (Gr. *Zénôn*), the founder of the Stoic philosophy, was born at Citium, a town in the island of Cyprus, about 350 B.C. It is uncertain at what time he came to Athens—probably when he was about twenty-five years of age. He is said to have lost all his property, which was considerable, by shipwreck in the neighbourhood of the Peiraios. This disaster may have had some effect in determining the austere character of his philosophy. He attached himself first to the Cynics—a sect who snarled at all mankind—but was soon repelled by their grossness of manners, intellectual narrowness, ignorance, and incapacity. After studying for twenty years under Stilpôn of the Megaric sect, and under Xenokratês and Polemôn, the successors of Plato in the Academy, he resolved to establish an ethical school of his own, of a more practical and not less enlightened character than any at that time in vogue. He founded the sect and philosophy of the Stoics, so called from *Stoa Poikilê*, the Painted Porch—the place in Athens where he delivered his doctrines, and the walls of which were adorned with the paintings of Polignôtos, representing the victories gained by the Athenians over the Persians. Zeno wrote many works, but none of them are extant. From their titles we may judge them to have been of no small ethical interest—"On the Life according to Nature;" "On Impulse;" "On the Nature of Man," and others of a similar purport. Zeno died at an advanced age, probably about 260 B.C. For an account of the doctrines of Zeno and his successors, see the article *Stoics*.

**ZENO'BIA** (Gr. *Zinobia*), the famous Queen of Palmyra, was the daughter of Amron, an Arab chief who possessed the southern part of Mesopotamia, but she claimed her descent from the Macedonian kings of Egypt. She was a princess of remarkable beauty and courage, and of a vigorous understanding, which she had strengthened and adorned by study. She was well acquainted with the Greek, Latin, Syriac, and Egyptian languages. "Her complexion," says Trebellius Pollio, "was rather dark; her eyes black and piercing; her teeth were as white as pearls; and her voice clear, strong, and harmonious. She lived in great state, like the kings of Persia. Her general character was frugal, but on every proper occasion she was magnificent and liberal." The military successes of Odenathus, her second husband, were in a great measure to be ascribed to the sagacity and heroic valour of Zenobia, who often marched with the troops. After brilliant achievements against the Persians, in all of which Zenobia took a prominent part, Odenathus assumed the royal title, and was acknowledged by Gallienus as his colleague in the Roman Empire. The Palmyrenian prince enjoyed his sovereignty but a short time. He was assassinated at Emesa in Syria about the year 266. After this Zenobia ruled alone, with the title of Queen of the East. She governed with remarkable prudence and vigour Palmyra and Syria, and her dominions extended from the Euphrates to the frontiers of Bithynia. She is even said to have exercised authority over Egypt. She was not more remarkable for her warlike achievements than for the magnificence of her court, for her intellectual acquirements, and the patronage which she bestowed on literature. The celebrated philosopher Longinus was her secretary, and one of her most trusted advisers. It was mainly by his advice that the intrepid princess threw off her allegiance to the Roman Empire and wrote a letter to Aurelian, who had assumed the purple in 270, declaring

her independence. This step, of course, provoked the hostility of the emperor, who passed over into Asia and defeated the forces of the Queen of the East. The siege of Palmyra was vigorously pressed by Aurelian in person, but the defence was of the most heroic and desperate character. When further resistance was impossible Zenobia fled, but was overtaken by a body of Aurelian's light horse and brought back a prisoner to the Roman camp. Palmyra soon after surrendered, and to the disgrace of the victor he caused a number of her counsellors, and among the rest Longinus, to be put to death, and laid the city in ruins in 273. The Queen of the East herself, clothed in a purple robe and fettered by massive golden chains, graced the triumphal procession of the emperor. She was treated, however, with unwonted clemency. Aurelian presented her with an elegant villa at Tibur, where she spent the remainder of her life in honourable retirement. Her only surviving son received a small province of Armenia, with the title of king. "Her daughters married into noble Roman families, and her race was not yet extinct in the fifth century."

**ZEOLITES**, so named from the manner in which they froth up when fused under a blowpipe, are minerals occurring in the cavities of volcanic rocks. They are hydrated double silicates of alumina and soda, lime, magnesia, or other similar bases; and are deposited from percolating water in the hollows, this water having dissolved the materials while passing through the rock-mass. Sometimes the zeolites occur as well-defined crystals, sometimes as irregular glassy incrustations, and sometimes in the form of beautiful clusters of delicate needles. A good example of the latter is the common natrolite of the Giant's Causeway, Antrim. Other members of the group are Analcime, Stilbite, and Harmotome.

**ZEPHANIAH**, one of the twelve minor prophets, a descendant of Hezekiah, supposed by Aben Ezra and others to be the king of that name. He prophesied in the reign of King Josiah, probably about 625 B.C. The book of Zephaniah is divided into three sections. In the first he predicts the desolation of Judea, and contrasts the prosperity and insolence of the people with the horrors impending over them. In the second division he calls the people to repentance, and predicts the ruin of Philistia, Moab, Ammon, Cush, and Nineveh. The third contains threatenings and invectives against Jerusalem, but afterwards promises deliverance and prosperity to the righteous remnant of Israel. Among the best commentaries on this little book are those by Hitzig (third edition, 1863), Reinko (1868), and Kleinert (in Lange's "Bibelwerk," 1868).

**ZEPHYROS** or **ZEPHYRUS**, the god of the west wind, was the son of Astraios and Eös. By the harpy Podargé, Zephyrus was the father of the famous horses of Achilles, Xanthos and Balios.

**ZEPHYRINUS, ST.**, Bishop of Rome from 201 to 219, sixteenth in the long list of Popes. He succeeded Victor I., and was succeeded by Callistus I. He was under his rule that the great Sabellian heresy raged; and it was rather unfortunate that while Sabellius was both learned and bold, Zephyrinus was unlearned and wavering.

**ZERDUSHT**. See ZOROASTER.

**ZE'RO** (from the Italian *zefiro*, from the Arabic *sifir*, a cipher, nothingness). In the thermometer it indicates the point at which the graduation commences. On Fahrenheit's scale it is placed at 32° below the freezing point, being the temperature (nearly) of a mixture of snow and salt. On Réaumur's and the Centigrade it marks the actual point at which water freezes.

**ZE'US**, the greatest of the gods in the classical Olympus (Lat. *Jupiter*, i.e., *Deus pater*, Deus being the same as Theos or Zeus), was the son of Kronos and Rhên; and the brother of Poseidôn and Hades (Lat. Neptune and Pluto),

as well as of his consort, Hêra, and of the goddess Dêmêtêr and Hestia (Lat. Juno, Ceres, Vesta). By Hêra he had Arês (Lat. Mars), and Hêphaistos (Lat. Vulcan), and one daughter, Hêbê.

The way in which Zeus drove his father Kronos and the Titans from the sovereignty of heaven is told in the article *KRONOS*: and in the division of the world he took the heavens, his brother Poseidôn the sea and Hádês, the under-world. But it was decreed that any son born of his first wife, Mêtis, should overturn him in his turn. Zeus therefore took the unborn child from the body of its mother, and sheltered it in his own head, whence in due time sprang the goddess Athena (Lat. Minerva), fully grown and fully armed. By his second wife, Themis, Zeus had the Hours and the Fates; by Eurynomê he was the father of the Graces; by Mnemosunê (Memory) of the Muses; Dêmêtêr bore him Persephonê (Proserpina), and Lêtô (Lat. Latona) became by Zeus the mother of Apollo and Artemis. Dionysos was his son by Semelê, born from Zeus' thigh after the lamentable fate of his mother, and Hêraklês was the fruit of an amour with Alkmêne. It would be tedious to give an account of the many amours of Zeus: most of which, however, rely upon atmospheric phenomena for their basis, Zeus (Sans. *Dyaus*) really meaning the clear sky. The most famous statue of antiquity was the Olympian Zeus at Elis, by Phidias.

**ZEUXIS**, the greatest ancient Greek painter, except perhaps Parrhasios, flourished B.C. 424 to 400. He was a native of Herakleia, and came to Athens after the Peloponnesian War; then passing on to Maceonia he decorated the royal palace. He also visited South Italy (Magna Græcia), and painted for the temple of Hêra, in the city of Krotona (Crotona), his celebrated "Helen," the five most beautiful virgins of the city setting to him as models. He became very wealthy, and at last gave his pictures away instead of selling them. He painted so naturally that the birds flew to peck the grapes in his picture, when he was contesting with Parrhasios for a prize. Victoriously he cried to his rival to draw aside his curtain, but to his mortification found that the curtain in Parrhasios' frame was itself the picture. Zeuxis gave up the contest: for he had only deceived birds, Parrhasios had deceived an artist.

**ZIL**, the Turkish CYMBALS.

**ZIMMERMAN, JOHANN GEORG VON**, a Swiss physician and author, was born at Brugg, canton of Bern, 8th December, 1728. He was educated at the University of Göttingen, where under the direction of Haller he pursued an extremely comprehensive course of study with such zeal as to impair his health for the remainder of his life. In 1751 he took the degree of M.D., producing a physiological dissertation on irritability which was long held in esteem. He commenced practice at Bern in 1752, but soon removed to Brugg, where he remained during the next fourteen years with a growing fame both as a physician and author. Patients flocked to him from all parts of Switzerland, and the neighbouring countries, and here he planned and wrote some of his principal works, including his treatise on "National Pride" in 1758, which was speedily translated into the chief European languages, "Experience in Medicine" published in 1763-64; and the first draft of his celebrated work on "Solitude." In 1768 he received the offices of anic counsellor and court physician at Hanover. In 1771, however, an internal disorder compelled him to resort to Berlin for an operation, which, though successfully performed, only procured him temporary relief, but while at Berlin he made the acquaintance of Frederick the Great. In 1784-85 he brought out in a complete form his celebrated treatise on "Solitude" in four volumes 8vo, which was soon translated into most European languages, and which procured for him many illustrious friends. This is the ablest of all his produc-

tions, and that with which his name is commonly associated. In 1768 he attended Frederick the Great in his last illness, and after the king's death Zimmernann published some accounts of his conversations with the king and notes on his reign, which involved him in controversies which continued till his death. From the time of the close of his collegiate career to the end of his life he was greatly troubled by hypochondria, and during his later years this developed into positive insanity. In 1794 he was compelled to give up all his occupations by the progress of mental disease, and he died 7th October, 1795. His autobiography appeared at Hanover in 1791.

**ZINC** or **SPELTER**, a metal known to the ancient Greeks, and used by them in making brass. The principal ore is calamine, in which the metal exists as a carbonate; it is also found as sulphide in zinc blende, as oxide in zincite or red zinc ore, and as silicate in silicious calamine. It is also found occasionally as arseniate and phosphate, and in the metallic state. The calamines, blende, and red oxide are all used in the manufacture of the metal. These ores are first roasted to remove sulphur and carbonic acid, and to render them more reducible. The metal is reduced from the calcined ore by charcoal or coke, at a red heat, in covered crucibles or muffles constructed of iron or clay, and furnished with an outlet to convey off the vapour of the metal, which is volatile at this temperature, to suitable condensers, in which it is collected in a molten state. It is a white metal, with bright metallic lustre when polished. It is brittle, with a highly crystalline fracture. At a temperature between  $100^{\circ}$  C. ( $212^{\circ}$  Fahr.) and  $150^{\circ}$  C. ( $302^{\circ}$  Fahr.), it becomes malleable, and can be rolled into sheets. At  $210^{\circ}$  C. ( $410^{\circ}$  Fahr.) it again becomes brittle, and can be easily powdered. It melts at  $412^{\circ}$  C. ( $773^{\circ}$  Fahr.), and boils at  $1040^{\circ}$  C. ( $1901^{\circ}$  Fahr.). The vapour takes fire in the air and burns with a white flame, accompanied by dense white clouds of the oxide. The symbol is Zn; the atomic weight is 65; the specific gravity 6.862. Zinc is permanent in the air, and in sheets is largely used in commerce for roofing purposes where there is much exposure to air and water, and also for covering sheet-iron, in the form known as galvanized iron, which is thus protected from oxidation. It is very soluble in dilute acids, except when absolutely pure.

Zinc is also soluble in alkalis, forming a zincate of the metal. It forms a number of alloys with other metals, of which the most important is that with copper, known as brass. The alloy with tin is beaten into thin sheets, known as spurious silver leaf. Alloys with copper and tin form hard metals, little attacked by acids, and used for machinery. Bell metal is an alloy of zinc with copper, tin, and lead.

Zinc forms only one oxide, known as flowers of zinc ( $\text{ZnO}$ ); it occurs native as zincite or red zinc ore. It is obtained by burning zinc in air, and is much used as a white pigment, under the name of zinc white. It has the advantage over white lead, of not being blackened by the fumes of sulphuretted hydrogen. The hydrate ( $\text{ZnOH}_2\text{O}$ ) is a white gelatinous precipitate, obtained by precipitating salts of zinc with ammonia; it is soluble in excess of the alkali. The pure oxide is made by calcining the precipitated carbonate. It becomes yellow on heating, and colourless again on cooling. It is very soluble in dilute acids and alkalis.

Zinc chloride ( $\text{ZnCl}_2$ ), or zinc butter, is a white volatile solid, very deliquescent; it can be crystallized in octahedrons. It has a great affinity for water and other organic bodies. It has the singular property of dissolving silk. A dilute solution is used as an antiseptic, under the name of Burnett's fluid. The dry chloride is used in surgery as a caustic.

Zinc bromide ( $\text{ZnBr}_2$ ) is a deliquescent crystal resembling the chloride. Zinc iodide ( $\text{ZnI}_2$ ) is a fusible white salt

used in photography. Zinc fluoride ( $\text{ZnF}_2$ ) crystallizes in white octahedrons.

Zinc sulphide ( $\text{ZnS}$ ) is found native as zinc blende, known in Cornwall as black jack. The hydrated sulphide ( $\text{ZnS}, \text{H}_2\text{O}$ ) is a white powder obtained by precipitating a salt of zinc with ammonium sulphide. It dissolves readily in dilute mineral acids, and in acetic acid.

Zinc ethyl, or zinc ethide,  $\text{Zn}(\text{C}_2\text{H}_5)_2$ , is a remarkable body discovered by Frankland, and is specially interesting as the first of a number of organo-metallic bodies, in which a metal is introduced into an organic compound. Zinc ethyl is a colourless liquid, having the specific gravity 1.189, and boiling at  $118^{\circ}$  C. ( $244^{\circ}$  Fahr.). It is spontaneously inflammable on exposure to air, burning with a green flame. Zinc methyl and zinc amyl are similar bodies.

Zinc is distinguished from other metals by its volatility, and by the yellow colour of the oxide when heated before the blowpipe, and becoming white on cooling. All the zinc salts are colourless, and in solution give white precipitates with ammonium sulphide and with potash, ammonia, and ammonium carbonate, which are soluble in excess of the precipitants. It is usually estimated as oxide, obtained by igniting the precipitated carbonate.

Several salts of zinc are used in medicine; the sulphate is a strong and rapid emetic in doses of 10 to 30 grains, used in cases of poisoning; the bromide is administered for epilepsy in doses of 3 to 10 grains; the chloride is used as a disinfectant for wounds, and as a caustic. The citrate, lactate, and valerianate are also employed as anti-epileptics. The sulphate is much used externally as a lotion, and the oxide, carbonate, and oleate in ointments for wounds and for skin diseases.

**ZING'ARI** or **ZINCA'LLI**. See *CYPRESS*.

**ZINGIBER'ACEÆ**. See *SCITAMINÆÆ*.

**ZIN'ZENDORF** UND **POTTENDORF**, **NIKOLAUS LUDWIG GRAF VON**, an eminent religious reformer and bishop of the Moravians, was born in Dresden, 26th May, 1700. His father, a Saxon minister of state, died when the son was very young, and the latter was brought up by his grandmother, the Baroness Gersdorf, an earnest disciple of Spener, who was also the young count's godfather. He studied at Halle and Wittenburg, and after a few years spent in travel, he married in 1722 the Countess Reuss von Ebersdorf, and settled on his estate some Moravian families who had fled from persecution in their own country. The settlement rapidly increased, and received the name of Herrnhut (protected of God). In 1734 Zinzendorf obtained ordination at Tübingen, and afterwards travelled into different countries to extend his society, founding many congregations and missions. In 1736 he was banished from his home on account of his religious innovations, and he went to Berlin, where, in 1737, he was consecrated a bishop of the Moravian church. His persecutors, however, obtained a decree of perpetual banishment from Saxony, and during the next ten years he pursued his religious labours in America, Holland, England, and Livonia. In 1747 he was permitted to return to Saxony, and he spent his remaining years at Herrnhut, where he died, 9th May, 1760, after an illness of a few days. He was a sincere, zealous, noble man, and his labours were attended by a great influence for good both in Europe and America. His funeral was attended by thirty-two preachers and missionaries whom he had trained, and he had also indirectly given a great impetus to the methodist revival in England. Zinzendorf wrote several controversial works, narratives of his labours, and numerous hymns. See Spangenberg, "Leben des Grafen von Zinzendorf" (1772-75; translated by S. Jackson, 8vo, London, 1838).

**ZIO**, or in ancient English *Tio*, the god whose day is Tuesday (*Tuesdaeg*), was the son of Wotan, the supreme

god of the *Vorso* Olympus. He is the god of battles, the nearest approach to the Greek *Arès* or the Roman *Mars*. He was single-handed, because when it was necessary to bind the monster *Fenris* (wolf), *Zio* put his hand in the brute's mouth as a pledge that he should be loosened, and when the gods refused to release him he bit off *Zio's* hand at the wrist.

**ZIR'CON**, is a naturally occurring silicate of the rare metal zirconium, met with in crystalline rocks, usually in the form of four-sided prismatic crystals, terminated by pyramids. The common varieties are generally of a brownish or yellowish colour, more or less transparent, and of adamantine lustre. They are discovered especially in Canada, Scandinavia, Germany, Upper Egypt, and occasionally in Scotland and Ireland. The finest transparent, colourless, pinkish, or orange-tinted varieties are esteemed as an inferior gem, *HYACINTH*, *Jacinth*, or *Jargoon*; these stones are obtained chiefly from the river sands of Ceylon.

**ZIRCO'NIUM** is one of the rarer metals of the alkaline earths. It was discovered by Klaproth in 1789, in the mineral zircon or zirconite. It is also found in fergusonite, eudialyte, polymignite, and some other rare minerals. Like silicon, the metal assumes three modifications, amorphous, crystalline, and graphitoid. It was first obtained by heating the double fluoride of potassium and zirconium with potassium and dissolving out the salts; thus prepared it is an amorphous black powder. If aluminium be substituted for the potassium, and a white heat be applied to the mixture of fluorides, crystalline zirconium is obtained in hard, brittle, metallic plates resembling antimony. The graphitoid form is in steel gray scales. The symbol is *Zr*; the atomic weight 89.06; the specific gravity 1.15. When heated in air it takes fire, forming the oxide zirconia. The metal is soluble only in hydrofluoric acid. Zirconia ( $ZrO_2$ ) is the only oxide. It is a white powder, of specific gravity 4.35, the particles of which are hard enough to scratch glass. It glows with great brilliancy when ignited, and forms the basis of the ignited mantle in the Welsbach incandescent gas light. The mantle is a cotton wick soaked in solutions of salts of zirconium and lanthanum and dried. This is suspended over a Bunsen gas flame, which burns out the wick, and leaves an incandescent skeleton of oxides of zirconium and lanthanum, which become intensely luminous in the flame. Zirconia hydrate ( $ZrO_2 \cdot 2H_2O$ ) is precipitated as a white jelly by ammonia from salts of zirconium. It is sparingly soluble in water, forming an alkaline solution. It also acts as an acid, and is therefore also called zirconic acid; it forms salts with the alkalis and alkaline earths, called zirconates. The formula of disodic zirconate is  $Na_2ZrO_3$ ; these salts are soluble in water. Zirconium chloride ( $ZrCl_2$ ) is formed when the metal is exposed to chlorine gas as a white sublimate, very soluble in water. A hydrated chloride is obtained in colourless needles. Zirconium bromide ( $ZrBr_2$ ) resembles the chloride, but is decomposed on heating to zirconia and hydrobromic acid. The fluoride ( $ZrF_4$ ) is also soluble in water; it combines with other fluorides, forming double salts known as fluozirconates. These are generally soluble crystalline salts. The formula of the sodium salt is  $5NaF \cdot 2ZrF_4$ . Zirconium salts are distinguished from those of yttrium and metals of the cerium group by precipitation by potassium sulphate, which removes it from solution as potassium-zirconic sulphate, an insoluble salt, and also by precipitation as zirconium hypsulphite with sodium hypsulphite. It is usually estimated as zirconia.

**ZIS'KA** or **ZIZ'KA, JOHN**, the famous leader of the Hussites, was born at Trocnov, Bohemia, in 1360. He was page to King Wenceslas, then served in the English army in France, and with great honour subsequently against the Teutonic knights, losing his right eye in the final encounter. After the close of that war he joined the

Austrians against the Turks. He then espoused the cause of the Hussites, after the foul judicial murder of their leader, John Huss. The war for liberty of thought began with the ejection of thirteen Catholic magistrates from the windows of the Council Chamber at Prague in 1419. The king (Wenceslas) died, and the Hussites refused to submit to the Emperor Sigismund, his brother, the betrayer of their beloved leader, till he had guaranteed their liberties. With only 4000 men they defeated the imperialist forces of ten times their number. Prague fell in 1421, and Ziska covered the country with fortresses, the chief of which was Tabor. This year he lost his remaining eye, but blind though he was, he led his devoted followers from victory to victory, fighting no less than thirteen pitched battles. At last Sigismund gave way, admitted the right of the Hussites to their liberty of conscience, and created Ziska governor of Bohemia. But before he entered on his functions he was seized by the plague, and suddenly died, 1424. It was long believed that at his command his skin was stripped from his body, and was made into a parchment for a drum, with which the Hussites beat their advance to battle, so that even when dead he might be a terror to his foes.

**ZITH'ER**, a favourite musical instrument of two very diverse forms. The chief form is a shallow sound-box, across the upper table of which the strings are strained, and which is played by plucking the strings with the fingers or with a plectrum: in fact, it is the lineal descendant of the ancient kithara of the Greeks, and the psaltery of the Assyrians and Hebrews. There is one large round sound-hole in the centre. The modern varieties have a finger-board added to the left of the open or "accompaniment" strings, and above this run the melody strings, usually five in number in large instruments, and of metal; the "accompaniment" strings being of catgut in the upper register, and of silk overspun with copper in the lower register. The finger-board is fretted like that of a guitar. The instrument is played lying flat on the table. The performer fingers or "stops" the melody strings with his left hand, and sounds them with a metal plectrum carried by a ring on the thumb of the right hand: the first three fingers of the right hand, and occasionally the fourth also, plucking the accompaniment strings at the same time. The best instruments have a flat bridge over which all the strings pass. The zither is capable of great beauty of effect; the tone is not powerful, but is of keen sympathy, and an emotional player finds the zither intensely responsive to his touch. The portability of the zither adds to its merit: it is as easy to carry as a violin. The number of accompaniment strings on the usual zither varies from a dozen to twenty or thirty, but beyond thirty the instrument becomes too wide for effective use, except in very slow passages, as the hand cannot reach over so great a distance, and it must be remembered that the same hand plays both melody and accompaniment.

The second variety of the zither has a neck and finger-board like those of the violin, only that frets are added. Sound-holes of the old viol patterns are used. The instrument is played by a bow, hence its name "bowed-zither" (streich zither). It has only four strings, and becomes, in fact, a sort of variety of the violin, but it is easier to play.

**ZOANTHA'RIA** is a subclass of the *ACTINOZOA*, a class of Cœlenterata, containing the *SEA-ANEMONES* and many of the *CORALS*.

**ZO'DIAC** is the name given to a zone of the visible heavens, extending in breadth to certain equal distances on both sides of a great circle of the celestial sphere, in the plane of the ecliptic or of the earth's orbit produced. The zodiac is the region containing the paths of the sun, moon, and planets. It was marked out by early astronomers into twelve parts, each with its constellations, and these twelve constellations came to be noted, for brevity's sake, by certain *signs*. In just the

same way the sun, moon, and planets were also denoted by signs, and the signs of the latter are given in the article PLANETS. The order of the constellations along the zodiac, reckoning from west to east (Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces), is conversely given in the following well-known doggerel, to which the signs have been added:—

The Ram (♈), the Bull (♉), the Heavenly Twins (♊),  
And next the Crab (♋) the Lion (♌) shines,  
The Virgin (♍), and the Scales (♎);  
The Scorpion (♏), Archer (♐), and He-Goat (♑),  
The Man that holds the Waterpot (♒),  
The Fish (♓) with glittering tails.

In these mediæval signs, the constellations themselves are most ingeniously figured. The diverse horns of the Ram and the Bull, the characteristic variation between the two Fish and the Twins, the capital indication of the water of Aquarius, the arrows of Sagittarius, and the beam of the Libra (the Scales), the venomous-looking jointed Scorpion, and the glaring eyes and high-crested forehead of the Lion, as well as the M.V. anagram of Mary Virgin, are apparent at the first glance. The sign for Capricornus is a modified letter H standing for the Latin *Hircus* (the He-goat), and that for the Crab is easily turned into a rude outline of the creature's oval shell, in front of which its eyes dully protrude.

When the word *signa* is used alone in astronomy, especially in the astronomical notes of calendars, as when, for instance, the sun is said to be in the sign Aries, it has a very special meaning. Originally the signs and their constellations were together, but now, by the operation of the PRECESSION of the equinoxes, the sun enters the constellation *Pisces* (the Fish) at the vernal equinox (25th March), whereas formerly he used to be entering *Aries* (the Ram) at that season. Under these circumstances, to avoid confusion, it was agreed by astronomers that the sign Aries (♈) should be conventionally put at the vernal equinox, and the other signs at equal distances round the ecliptic, regardless of the position of the constellations. Thus it comes about that when we say, "The sun enters Aries," we are referring to a conventional sign Aries, for as a matter of fact the sun is entering the stars of *Pisces*. The same occurs with every other constellation and its sign. A reference to our plate CONSTELLATIONS will make this clear at a glance, for every sign will be found drawn in the next constellation to the west. The sign Aries (♈) is in the constellation *Pisces*, the sign Taurus (♉) is in the constellation Aries, the sign Gemini (♊) is in the constellation Taurus, and so on. The term zodiac means appertaining to animals (*zōdiakos*), and refers to the animals represented by the various constellations.

**ZODIACAL LIGHT.** In the western horizon, on a clear spring evening immediately after sunset, or in the east in autumn shortly before sunrise, a faint pearly light may be seen. This is the zodiacal light; it extends out on each side of the sun, and nearly in the plane of the ecliptic. Near the equator, where the ecliptic rises high above the horizon, the zodiacal light can be observed nearly equally well all the year round. It is brightest nearest the sun, and can generally be traced about 90 degrees from the sun, though in a very clear sky between the tropics it has been traced completely round the heavens. Collecting together all the various observations, it will be seen that the zodiacal light is a vast lenticular mass surrounding the sun, lying nearly parallel to the ecliptic, and extending rather beyond the distance of the earth's orbit. Whatever be the material of which the zodiacal light is composed, it must be of extreme tenuity, inasmuch as faint stars are easily visible through its entire thickness.

**ZOETROPE** (i.e. wheel of life), an excellent toy producing a very perfect optical illusion through the

phenomenon called the *persistence of vision*. It is an extension of the principle of the THAUMATROPE.

In its simplest form a zoetrope consists of a cylinder rotating round its vertical axis. It is pierced round its upper edge by a number of vertical slits. Below the slits a long strip containing a series of figures of the same subject is inserted within the cylinder, each figure being in an attitude one stage in advance of its predecessor, and the whole series constituting one act of motion. Thus a sawyer may be (1) applying his saw to the wood, (2) thrusting it down, (3) halfway down, (4) quite down, (5) halfway up, (1) quite up, represented in five successive figures. On rotating the instrument, and looking through the slits as they rapidly pass the eye, the figure will appear to be in motion, for the image of the one state has not left the eye before the image of the next state is superposed upon it. The more numerous the states the more perfect the illusion. The strips or series are removable, and may of course be infinitely varied. Sometimes the zoetrope is used scientifically to show wave-motion, pendular motion, and the like, with very happy effect.

**ZOFFANY, JOHN, R.A.**, usually called *Zoffany*, a distinguished portrait painter, was born at Regensburg, of a Bohemian family, about 1735. Zoffany came when still young to England, and was in 1768 elected one of the original thirty-six members of the Royal Academy in London. In 1771 Zoffany acquired the patronage of George III. He had already made himself famous by his theatrical portraits, single and in groups, and some of these pictures are exceedingly clever. He painted for George III. several pictures and portraits. He died at Kew in 1810.

**ZŌLOS**, a grammarian of Amphipolis, flourished in the time of Philip of Macedon. He was called *Homeromastix* or *Homer's Scourge*, because he wrote against Homer. He flew at high game, as, besides Homer, he attacked Plato and the great Greek writers. Zōilos, indeed, seems to have been of an envious and crabbed temper, and his name in consequence has come to be used proverbially as expressive of all the worst qualities of the critic.

**ZOLL VEREIN** (customs-union), the old union of the German states (exclusive of Austria), which was formed under the leadership of Prussia for purposes of external customs duties after the break up of the old German (Holy Roman) Empire. It began in 1819, but it was not till 1828 that the first important state (Hesse Darmstadt) joined Prussia, and the last (Hanover) did not come in till 1851. It long served as a link which, though slender, bound the various detached states together, until the great war of 1870 against France united all Germany once more into a great empire.

**ZONE** (Gr. *zone*, a belt), a portion of a sphere intercepted between two parallel lines. When, on the globe of the earth, one plane is the equator, and four others are drawn parallel to it, two of which contain the circles in which the sun is vertical at the summer and winter solstices, and the two others, the circles of which are as far distant (on the earth) from the poles as the former are from the equator, the earth is divided into six zones (the polar segments being called by that name as well as the others). Of these the portions which contain the two poles are called the *North* and *South Frigid Zones*. Throughout these zones the sun never rises during a part of the winter, and never sets during a part of the summer. The parts intervening between the arctic circle and the summer solstice parallel, and between the antarctic circle and the winter solstice parallel, are called the *North* and *South Temperate Zones*. In these there is always a rising and setting of the sun for every day in the year, but nowhere is the sun ever vertical. The belts between the summer solstice parallel and the equator, and between the winter solstice parallel and the equator, are called the *North* and *South Torrid Zones*. In these there is always night and day,

and at every point the noonday sun is vertical twice in the year.

**ZOOLOGY** (Gr. *zōon*, animal, and *logos*, discourse) is the science which treats of animals [see **ANIMAL**] and is a branch of **BIOLOGY**, the science of living things, itself a branch of natural science or natural history. Special terms are commonly used for certain subdivisions of the science itself, as *Ornithology*, that branch which deals with birds; *Ichthyology*, which treats of fishes; *Entomology*, which is concerned with insects. Less familiar terms are *Mammalogy*, *Herpetology*, and *Helminthology*, having for their subjects respectively mammals, reptiles, and parasitic worms; and many similar terms have been coined by specialists. Other subordinate sciences deal with the animal kingdom as a whole, but from a special standpoint—such are *Comparative Anatomy*, *Zootomy*, *Physiology*, *Embryology*, and *Taxonomy*.

The father of zoology as a science was the great Greek philosopher Aristotle, the main features of whose system of classification are preserved to this day. He divided the animal kingdom into two great groups—*Enaima*, animals with blood, and *Anaima*, animals without blood, corresponding to the groups *Vertebrata* and *Invertebrata* of modern zoologists. The term *Enaima* was due to the idea that the red colouring matter (hæmoglobin) was essential to true blood, but he also recognized, as a distinguishing mark of this group, the presence of a bony axial skeleton. He divides the *Enaima* into four classes:—(1) *Viviparous*, four-footed animals, including the whale, corresponding to the modern class *Mammalia*; (2) *Birds*; (3) *Oviparous*, four footed or footless animals, corresponding to the modern classes *Reptilia* and *Amphibia*; and (4) *Fishes*. The *Anaima* are in like manner divided into four classes:—(1) *Malakia* or soft animals (molluscs, such as the cuttle-fishes); (2) *Malacostacea* or soft animals with shells (crustaceans, such as the crab, lobster); (3) *Entoma* (Insects, Arachnida and Myriapoda); (4) *Ostracodermata*, or animals with hard shells (molluscs, such as the snail, mussel; Echini).

The only other ancient zoologist of any note is Pliny the Elder, who falls far behind Aristotle in his scientific grasp, and whose work on natural history is a mere compilation. With the exception of Bishop Isidor of Seville, and the alchemist Albertus Magnus, who wrote works on natural history, the science of zoology slumbered until the Renaissance, at the end of the fifteenth century, revived the study of Aristotle. Fresh facts were added to the science in the sixteenth and seventeenth centuries by Belon, Rondelet, Gessner, Aldrovandus, Swammerdam, Leeuwenhoek, and others. The first great improvements upon Aristotle's classification were made by the English naturalists, Ray and Willughby, at the end of the seventeenth century. Their work was further extended in this direction by Linnaeus, whose "*Systema Nature*" (1735) is constructed on the framework of Aristotle's classification. He divided the animal kingdom into six great classes:—

- |                                 |                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) <i>Mammalia</i> , . . . . . | <div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 3em; vertical-align: middle; line-height: 1;">{</div> <div style="display: inline-block; vertical-align: middle; padding-left: 0.5em;">           With warm red blood, and a heart composed of two auricles and two ventricles.         </div> </div> |
| (2) <i>Birds</i> , . . . . .    |                                                                                                                                                                                                                                                                                                                                           |
| (3) <i>Amphibia</i> , . . . . . | <div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 3em; vertical-align: middle; line-height: 1;">{</div> <div style="display: inline-block; vertical-align: middle; padding-left: 0.5em;">           With white blood and a simple heart.         </div> </div>                                          |
| (4) <i>Fishes</i> , . . . . .   |                                                                                                                                                                                                                                                                                                                                           |
| (5) <i>Insecta</i> , . . . . .  | <div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 3em; vertical-align: middle; line-height: 1;">{</div> <div style="display: inline-block; vertical-align: middle; padding-left: 0.5em;">           With segmented antennæ, . . . . .         </div> </div>                                             |
| (6) <i>Vermes</i> , . . . . .   |                                                                                                                                                                                                                                                                                                                                           |

A large number of the subordinate groups, orders, genera, and species into which Linnaeus divided these classes, especially as regards the higher classes, are still adopted. But his classification remained to some extent an artificial one. The great French naturalist, Cuvier, by his study of comparative anatomy, paved the way for a more natural system. He combined the first four classes of Linnaeus into one group, *Vertebrata*, and part of the class *Vermes* with *Insecta* (in which Linnaeus included not only insects, commonly so called, but also the whole of the modern group, *Arthropoda*), to form another group, *Articulata*. From what remained of the Linnaean class *Vermes* he established two other groups, *Mollusca* and *Radiata*, thus dividing the animal kingdom into four great groups or types.

The great advance since the time of Cuvier has been in the study of development or embryology, and the importance attached to it in classification, the aim of which has been profoundly modified by the doctrine of evolution. Most zoologists now recognize two primary divisions of the animal kingdom:—*Protozoa*, which may be briefly defined as unicellular animals, and *Metazoa*, which all pass from the unicellular to the multicellular condition, in which the body is composed of more or less differentiated tissues. The lowest group of the *Metazoa* is the *Calentata*, to which the remaining *Metazoa* are sometimes opposed, as *Calomata*, a name which has reference to the fact that they possess a body-cavity (coelom) distinct from the intestinal cavity. Of the *Calomata*, the groups (subkingdoms or phyla) *Echinodermata*, *Mollusca*, *Arthropoda*, and *Vertebrata*, are recognized as natural and well-defined. In addition, there are a number of small and more or less isolated groups—*Tunicata*, *Cyzoa*, *Brachiopoda*, *Rotifera*, *Annelida*, *Platyelminthia*, *Ce hy. ea*, *Nematemlinthia*, *Chaetognatha*, and *Enteropneusta*—most of which are sometimes grouped together under the title *Vermes*.

**ZOOOPHYTE** (Gr. *zōon*, animal, and *phuton*, plant) is a term formerly employed in zoology to denote the lowest forms of animal life, more especially those which have a more or less plant-like form and are stationary, such as sponges, corals, polyps, sea-mats, &c. The term is now obsolete as a definition of a group, though sometimes used for convenience of description.

**ZORN DORFF**, in Prussia, a village of insignificant character, in whose vicinity was fought on the 25th and 26th August, 1758, a great battle between the Prussian and Russian forces. The former, under Frederick the Great, won a complete victory. The Russians lost 21,529 men killed and wounded; the Prussians, 11,000.

**ZOROASTER** i.e. *Zarathustra Spitama*, whom the Persians called *Zerdusht*, and the Greeks *Zoroastres*, the founder of the Magian religion, lived in a very remote time under a king called Gushtasp, who has been incorrectly identified with Darius Hystaspes by many Parsee scholars. Zoroaster must be taken higher up into antiquity, probably contemporary with Moses, or certainly not less than 1000 B.C. He seems to have belonged to Eastern Iran or Bactria. Spitama was his family name; Zarathustra is a conventional title, apparently equal to "high priest." All the oracles or writings ascribed to Zoroaster by various authors must be considered the productions of later times, and consequently spurious. The religion attributed to him must have had a founder; and the Zend Avesta contains the name and person as though they had at least a historical basis. The marvellous stories which are related concerning him are later than the Zend Avesta, and do not invalidate his personal existence. The Greek and Roman writers evidently knew nothing of his country or age, and their contradictory accounts must be rejected as unworthy of credit. The true principles of Magianism are contained in the liturgies and institutes of the Zend Avesta, a work whose antiquity and genuineness cannot



be well doubted. The fundamental tenet of the system of Zoroaster was the doctrine of two principles, or two faces of God and of the universe. God, Ahura Mazda (whom we call Ormuzd), is the flame as well as the coal, the day as well as the night, good as well as what we call evil, life as well as what we call death. The one aspect of God is *Spenta Mainius*, the other is *Angra Mainius*, which mean "the white (holy) spirit" and "the dark spirit" respectively. This is the teaching of the oldest parts (the Gāthas, which alone are by the best scholars thought to be written by Zoroaster himself) of the Zend Avesta, strictly monotheistic, but recognizing the negative as well as the positive side of God. But in the later parts of the Zend Avesta *Angra Mainius* (whom we call Ahriman) became separated in idea from *Ahura Mazda* (Ormuzd), and took the position of the adversary or the devil; a very natural development in inferior minds of the dual conceptions of the great Magian. The later and corrupt doctrine is therefore that the two active principles of the universe were produced from all eternity. Ormuzd and Ahriman, each disposed to exercise his powers of creation in different ways. Ahriman became jealous and envious of the attributes of Ormuzd. The latter formed man capable of virtue; the former, changed into darkness from light by malice, introduced evil into the works of Ormuzd. Hence, good and evil are intimately commingled. At the last day, however, Ormuzd will triumph over his rival; Ahriman and his followers will sink into their native darkness, and virtue will prevail throughout the universe.

**ZOSIMOS**, a Greek historian who flourished in the time of the younger Theodosius. He was a court officer, and wrote a history (a mere compilation) of the Roman empire, in six books, which is still extant. The style is concise, neat, clear, and good. The first book gives a compendium of Roman history from Augustus to Diocletian; and the remaining five are fuller, reaching down to 425. The author was a pagan, and those emperors who embraced Christianity, particularly Constantine, have the dark shades of their characters minutely painted by Zosimos. The best edition is that of Ritzsch, 1784.

**ZOSIMUS**, Pope (417-418), is noteworthy for his willingness to consider the Pelagian heresy. His hesitation was short, and he ended by confirming the decision of the church at large upon the heresy.

**ZOUG'GARAH**, the Arab-Egyptian variety of the BAGPIPE.

**ZOUR'NA** or **ZAMR**, the oboe of Turkey, Egypt, Persia, and India, the double reed of which is made from slips of the stem of the *dowrah* (maize) stuck upon a small metal tube, covered by a perforated disc. The performer presses his lips against the disc, the reed being quite within his mouth and not held between the lips as with us. A further difference is that the fingering is not by the tips, but by the first joint of the fingers. Of course the whole instrument is of a quite simple description, but is often very well finished.

**ZUCCARO, FEDERIGO** (1513-1609), an Italian painter, is memorable to us by two portraits of Queen Elizabeth, one of which, a remarkable picture, is at Hampton Court. In 1586 Federigo visited Spain on the invitation of Philip II., who rewarded him magnificently for some paintings executed in the Escorial. He was the first president of the Roman Academy of St. Luke, which he was instrumental in founding.

**ZUG**, the smallest of the Swiss cantons, in the centre of the country, is bounded N. by Zürich, E. and S. by Schwytz, and W. by Lucerne and Aargau. It is about 14 miles long and 10 broad. The area is about 90 square miles, and the population in 1880 was 22,994. In the south-east the country is hilly and pastoral; in the north-west it is level, and contains much good corn land, many orchards, and vineyards. It is watered by the Reuss and the Sihl. The

greater part of Lake Zug—9 miles long and from 2 to 3 broad—and the whole of Lake Egeri is within the canton. The climate is mild. The chief exports are fruit, cattle, and dairy produce. The wine made is of inferior quality. There are some rather important fisheries in the lakes, and paper-making, tanning, silk and cotton spinning, are also carried on to a limited extent. The canton joined the Swiss confederation in 1352. It has now the eighth rank. The government is very democratic, every male inhabitant over nineteen years of age enjoying the franchise. The defile of Morgarten is on the border of the canton towards Schwytz, where 20,000 Austrians were defeated in 1315 by a small body of Swiss mountaineers.

**ZUG**, the capital and only town of the canton, is the ancient *Tugium*, and a small place with 3800 inhabitants, on the east side of Lake Zug, at the foot of the Zugerberg, 52 miles N.N.E. of Bern. It is on the railway from Zürich to Lucerne, and has a gymnasium and some small manufacturing. The population trade in paper, kirschwasser, cider, and dried fruits.

**ZUIDER ZEE**, a large gulf on the coast of Holland, inclosed by a chain of islands, forming a continuation of the peninsula of North Holland; length, 80 miles; breadth, about 40. It is shallow, and encumbered by sandbanks, and was formed in 1282 by an eruption of the German Ocean into Lake Flevo, which occupied what is now its southern part. Its oyster and plaice fisheries are valuable. It is gradually silting up; and in 1875 the States-general of the Netherlands voted a sum of nearly £10,000,000 sterling for the purpose of reclaiming the submerged land by drainage.

**ZULULAND**, a country lying to the north of Natal, between 27° 30' and 29° 14' S. lat., and 30° 40' and 32° 50' E. lon. Its length is about 125 miles, and its greatest breadth 112—the total area being about 10,000 square miles. The principal rivers are the White and Black Umfolosi, and the Tugela, which forms the boundary between Zululand and Natal. None of the rivers are navigable, and all are liable to great changes of level. In winter, which is the dry season, they dwindle into mere rivulets, while in summer heavy thunderstorms in the mountains cause them to swell into foaming torrents, often impassable for weeks. Physically the country may be divided into three districts—(1) The coast district, a strip of low-lying land, from 15 to 20 miles wide, thickly wooded and broken up by swamps and lagoons. This region is very hot and unhealthy for Europeans, especially from February to May, but possesses a fertile soil. (2) The middle district, consisting of undulating grassy plains partially wooded, and crossed by mountain ranges about 3000 feet high. (3) The upper district—between which and middle Zululand there intervenes a mountain range—consists of elevated, broken, and wooded country, descending from the great Drakenberg chain of mountains, which are from 20 to 30 miles further west. Cattle and sheep thrive on the pastures of this region, and wheat grows well.

Zululand is now practically divided between the English and the Boers. The events that have led to this may be briefly summarized as follows:—There had been a long-standing dispute between the Zulus and the Boers of the Transvaal Republic when the English annexed the latter, and in consequence the relations of the Natal government with Cetewayo, who had been acknowledged and aided to become king of the Zulus by the English, became strained. The Natal government also felt some fear of the strong military organization into which Cetewayo had formed his nation. War was declared, and in 1879 British troops entered Zululand in three columns. The centre, under Lord Chelmsford, suffered a terrible reverse at Isandhlwana, where 1000 British troops were slain. In spite of the heroic defence of Rorke's Drift it had to retreat. On the south Colonel Pearson defeated a Zulu force, but was be-



**ZÜRICH** (the ancient *Turicum*), the capital of the above canton, is situated at the north-west extremity of the Lake

**ZWICK'AU**, a town of Germany, in the kingdom of Saxony, situated on the Mulde, 60 miles W.S.W. of Dresden. It has five churches, an old castle, used as a house

of correction, a gymnasium, with a good library, linen and cotton manufactures, tanneries, dye-works, mills, and a large trade. Population, 35,005.

**ZWINGLI** or (as it is often Latinized) **ZUINGLIUS**, **ULRIC** or **HULDREICH**, an illustrious Swiss reformer and patriot, was born at Wildhaus, a mountain village of Toggenburg (now canton of St. Gall), 1st January, 1484. He received a good education at Basel, Bern, and at the University of Vienna, and in 1506 he was ordained by the Bishop of Constance, becoming the same year pastor of the large parish of Glarus, not far from his birthplace. Here he continued during the next ten years, devoting himself with great industry to the study of the New Testament in the original Greek, and to the duties of his pastorate. He also kept a vigilant eye upon the politics of the confederation, and both as preacher and author laboured zealously for the correction of public faults and abuses. In 1512, and again in 1515, he followed the banner of Glarus across the Alps into the plains of Lombardy, and bore a heroic part in the battle of Marignano, fought in September, 1515. His studies in the New Testament gradually led him to question many of the doctrines in which he had been trained, and by degrees he became known as an ardent reformer, as well as a prominent patriot. He had no communication with Luther, but by 1516 he had begun a work in Switzerland, very much on the same lines as that which had been commenced by the great German reformer. In 1519 he began his ministry as preacher in the Great Minister of Zurich, and at once declaimed with such power against the sale of indulgences as practised by Sanson, the Tetzeli of Switzerland, that the magistrates forbade Sanson to enter the city. In 1522 he demanded of the Bishop of Constance and all the governments of the confederation, the abolition of the law imposing celibacy upon the priests. This appeal aroused intense excitement, and in 1523 an important conference of Swiss pastors, curates, and preachers was held at Zurich, which ended in the triumph of the reforming party. On the 2nd April, 1524, he married Anne Reinhardt, a widow, and on the 3rd of November all the convents in the canton of Zurich were broken up, and their revenues applied to the support of religion, education, and charity. In 1528 Zwingli took a prominent part in the disputation at Bern, which issued in the introduction of the Reformation into that important canton, and the following year he went to Marburg to confer with Luther and the other German reformers upon the subject of the Lord's Supper. The conference was held on 1st and 3rd October, 1529, and it ended without full reconciliation, owing to the obstinacy and violence of Luther. On Zwingli's return home he found the cantons divided into two hostile confederations threatening each other with war upon religious grounds. In 1530 a minister passing through the Catholic cantons was seized and burned, and soon afterwards war broke out between the Catholic and Protestant confederations. Zwingli, who had favoured the appeal to arms, exposed himself bravely in fight, and on 11th October, 1531, he fell on the field of Cappel. His body was burned the following day by the Catholics, and

the ashes, after being mingled with the ashes of swine, were scattered to the wind. Zwingli has been censured for his confidence in the virtue of the civil arm. He believed that the fatherland belonged to Christ and the church, and must be defended for their sake, and that Switzerland could only give itself to Christ so far and so long as it was free. He was a man of fine appearance, prepossessing manners, polite address, pleasing conversation, extensive and sound learning, and brilliant genius. He has been represented as having been, more than any other of the reformers, radical and revolutionary in his reformatory movements; but Dr. Ebrard, in his "History of the Doctrine of the Lord's Supper," shows that this charge "is no better than a pure fiction of fancy or theological prejudice;" that Zwingli was fully as conservative as Luther, and much more so than Calvin, in the matter of doctrine and worship. Among all his writings Zwingli has left no symbol of faith, no system of positive theology. Attempts have, however, been made to elaborate and systematize his divinity from his works. See Dr. Eduard Zeller, "Das theologische System Zwingli's dargestellt" (Tübingen, 1853), and Sigwart, "Ulrich Zwingli: der Charakter seiner Theologie" (Stuttgart and Hamburg, 1855). A complete collection of his writings has been published in eight vols. (Zürich, 1828). Of the numerous biographies of Zwingli may be mentioned Hottinger's "Huldreich Zwingli und seine Zeit" (Zürich, 1841), and Christoffel's "Huldreich Zwingli's Leben und ausgewählte Schriften," in "Die Väter der reformirten Kirche" (Elberfeld, 1857).

**ZWOLLE**, a town of the Netherlands, in the province of Overijssel, on a canal communicating between the Yssel and the Vecht, 50 miles E.N.E. of Amsterdam. Its fortifications, once strong, have been levelled, and converted into promenades. It is well built, and has one of the finest market-places in the kingdom, several churches, one of them a fine old structure, once used as a cathedral, and a handsome town-house. It has manufactures of leather, soap, calico, cordage, &c., and a large transit trade. The population is about 22,000. In a monastery 3 miles distant lived for sixty-four years Thomas à Kempis, the famous author of the "Imitation of Christ."

**ZYGOPHYLLÆ** is an order of dicotyledonous plants belonging to the series Discifloræ, cohort Geraniales. [See BOTANY.] The species are not numerous, and are chiefly confined to the tropical and subtropical parts of the world. They are herbs, shrubs, or trees with opposite, stipulate, generally pinnate leaves. The flowers have four or five sepals and petals, as many or twice as many hypogynous stamens, generally with a scale at the base; an angular or winged several-celled ovary, with two or more ovules in each cell. The most important genus, economically, is *GUAIACUM*, a species of which yields a very hard wood, and also a gum-resin, both of which are used medicinally. The flower-buds of *Zygophyllum fabago* are used in the East for pickles, under the name of bean-capers. The aromatic seeds of *Zygophyllum coccineum* are used by the Arabs as a substitute for pepper. Some of the species are cultivated as greenhouse plants for the beauty of their flowers.







